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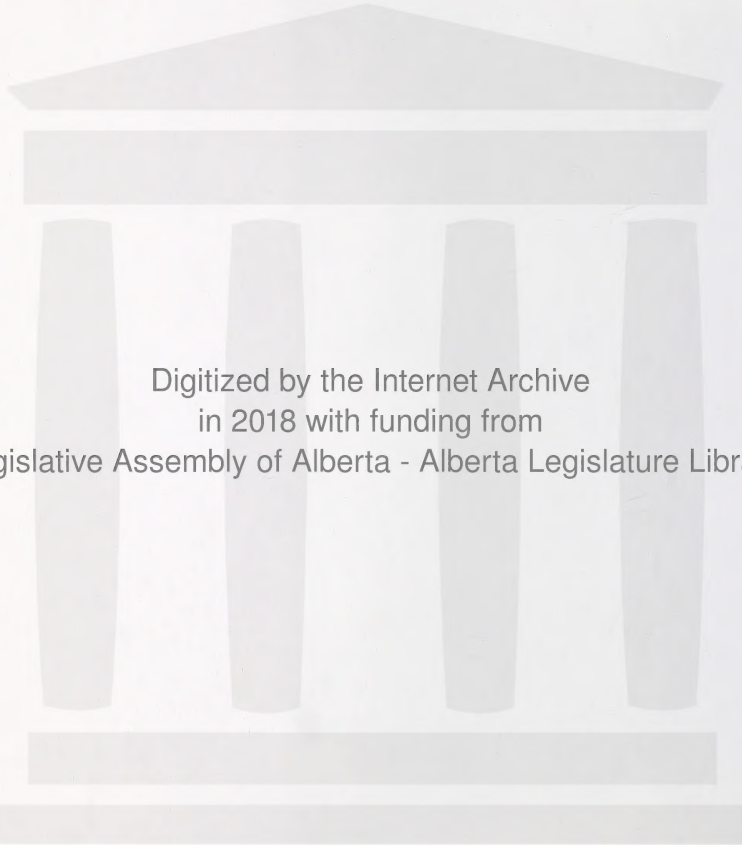

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RURAL ELECTRIFICATION IN ALBERTA

A REPORT TO

THE RESEARCH COUNCIL OF ALBERTA

ANDREW STEWART

MARCH, 1944.

ACKNOWLEDGEMENTS

The Report on 'Rural Electrification in Alberta' includes information which could not have been assembled without the active co-operation of many individuals and agencies; and acknowledgement is made of assistance generously given.

In the actual preparation of the report we have been assisted by Mr. W. I. McFarland, B.Sc., of the City of Edmonton Power Plant who collaborated in the preparation of Chapter I, and Mr. A. R. Brown, B.A., who undertook the task of compiling the material in Appendix I.

At the outset of the study, and as it progressed, guidance and advice were obtained from Dean R. S. L. Wilson, Faculty of Applied Science, University of Alberta. Also at the outset, consultation with and material provided by various officials of the Provincial Government, assisted in developing a sense of direction in the study. Reports on Water Resources of the Province were made available from the files of the Department of Telephones; and Mr. H. P. Brownlee, Statistician, Department of Trade and Industry, released his files on Power Facilities. Mr. J. W. Judge, Assessment Branch, Department of Municipal Affairs, prepared a statement on power consumption and average rates in hamlets, villages, towns and cities in the Province. Others consulted included Mr. W. D. King, Deputy Minister of Trade and Industry; Mr. O. S. Longman, Deputy Minister of Agriculture; and Mr. P. M. Sauder, Director of Water Resources, Department of Agriculture. Specifications for rural line construction were submitted to Mr. Vernon Pearson, Mechanical Branch, Department of Public Works, for his consideration. The late Prof. W. E. Cornish, Department of Electrical Engineering, University of Alberta, was, for a time, associated with the study and gave assistance at a number of points.

Reference is made in the Report to the agencies by whom the field surveys were made. All information gathered and compiled by Calgary Power Company, Canadian Utilities Limited, Dominion Electric Power Limited and others has been made available to us, and access has been had to any records desired. In connection with line specifications and estimates of costs full use was made of the professional knowledge of the engineers of the Utilities, and of the work already done by them. In carrying out the field surveys undertaken by the Research Council we had the assistance of Mr. A. R. Brown and Mr. L. E. Drayton. When it appeared as if it might be impossible to secure experienced fieldmen, and cars, to complete the programme of surveys, Dr. J. F. Booth, Economics Division, Dominion Department of Agriculture, generously agreed to provide the services of Messrs. B. K. Acton, B. H. Kristjanson, and J. L. Anderson, and the surveys were satisfactorily completed with their assistance.

During the course of our enquiry we have had correspondence with, and material from, officials of the Rural Electrification Administration, Washington, D. C.; the New Brunswick Electrification Commission; Dr. Weston, Rural Electrification Committee, Victoria, B. C.; and Mr. Herbert Cottingham, Manitoba Power Commission, Winnipeg.

Two Appendices are attached to the Report. Appendix I contains a brief description of each of the sixteen districts into which the potential service area was divided, and summary tabulations of census and survey material. Appendix II contains drawings, specifications, estimates of unit structure costs, sample survey plans, and estimates of construction costs for each of the areas surveyed.

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Appendix I. General Features of the Sixteen Districts in the Potential Service Area.

Appendix II. Specifications for Farm Distribution Lines, Unit Structure Costs, and Other Technical Material.

GENERAL SUMMARY

CHAPTER I. CENTRAL ELECTRIC STATION POWER IN ALBERTA

The Province of Alberta is generously endowed with power resources in water, coal, gas and oil; and power generated in the Province could be greatly increased from the resources available. The present installed capacity for primary power is about 190,000 horsepower. Approximately 320 million kilowatt hour were generated in 1941, and there has been a considerable expansion of power generated since that year. Transmission lines traverse most of the established and more densely settled rural areas of the Province. Only 19 incorporated places in Alberta are not served with power, and at least 126 unincorporated hamlets have electricity.

CHAPTER II. THE PRESENT STATE OF FARM ELECTRIFICATION IN ALBERTA, AND DEVELOPMENTS ELSEWHERE

Recent estimates indicate that of the approximately 100,000 farms in Alberta some 5.5% are electrified. Probably slightly more than 500 farms are served with central electric station power, and the remainder have individual farm plants. The main reasons for the small proportion of farms with central station power have been the low consumption per farm, high distribution costs, and the relatively low and variable cash incomes of farm families. Higher proportions of farms electrified in some other province are associated with larger numbers of customers per mile than are possible in Alberta; and with the charging of rates which do not provide sufficient revenue to cover the costs incurred by the utilities distributing power. Extension of farm electrification elsewhere has resulted from substantial reductions in construction and operating costs, and from assistance given to the provision of service to farms.

CHAPTER III. THE ALBERTA ENQUIRY: PRELIMINARY CONSIDERATIONS

If conditions in Alberta were similar to those in other parts of Canada and the United States where the number of farms electrified has been increasing, electrification of 30% of the farms in the Province over a ten-year period would be an accomplishment fully commensurate with achievements elsewhere. An area which includes all existing transmission lines was defined as the potential service area. This area contains about two-thirds of the rural population and of the farms in the Province. Within it conditions generally are relatively favourable to farm electrification, but the density of possible users is low in comparison with the eastern provinces of Canada. Electrification of 30,000 farms in ten years might result in an increase in energy consumed equivalent to 7% of the total energy consumed in the Province in 1941. Considering the probable drop in load after the war, and assuming that the energy released is not required for new industrial uses, there would seem to be in prospect ample power to proceed with an extensive farm programme. While electric energy has many uses on farms and in farm homes, and farm homes generally lack the conveniences which electric power makes possible, the success of any project depends in large measure on farm incomes and on a vigorous programme of load building.

CHAPTER IV. COST OF CONSTRUCTION OF FARM DISTRIBUTION LINES

Cost estimates were based on sample surveys conducted in 18 areas distributed over the potential service area, and on a 6,900 volt, single phase line similar to that already in use in farm electrification systems elsewhere. While substantial differences were apparent between the areas surveyed, the over-all average was 1.35 connections per mile of line and service tap-off with 54% of

all farms assumed to be connected. Estimates of construction costs per farm varied appreciably between areas surveyed, but the overall average was $576 per farm. This figure includes the cost of transformer, meter and other service structures; but does not include wiring in the house or between buildings. The estimate is based on a number of assumptions which might not be valid in the period during which lines were being constructed. It was further estimated that if saturation were increased from 54% to 71% the average cost per farm would be reduced to $519. The costs quoted include the service tap-off from the road line to the farm buildings. It was estimated that tap-off costs would vary from $183 for less than 50 feet to over $400 where the distance between the road line and the buildings exceeded 2,150 feet.

CHAPTER V. OPERATING COSTS AND ENERGY COSTS FOR FARM DISTRIBUTION SYSTEMS

Experience alone will provide an adequate basis for estimating the costs of operating the proposed type of farm distribution line in Alberta. Operating costs, including farm line operating expense, billing and collection, education and promotion, and general and administrative expense, were estimated at $1.99 per customer per month. Energy costs at the generating plant were estimated at 1.00 cents per kilowatt hour, and with line losses of 40%, at 1.65 cents per kilowatt hour at the farm. On the basis of these estimates combined operating and energy costs per customer per month would vary from $2.32 with a consumption of 20 kwhr per month, to $3.64 with a consumption of 100 kilowatt hour per month.

CHAPTER VI. FARM ELECTRIFICATION PROJECTS IN ALBERTA

If an extensive scheme of farm electrification were to be undertaken, it is estimated that, with a saturation of 54%, 30,000 farms

could be served from existing transmission lines at an average construction cost per farm of $600. Assuming interest at 3% and an annual levy of 2.75% for replacement, annual fixed charges would amount to $2.88 per customer per month. Total costs, including operating and energy costs, per customer per month would range from $5.20 at 20 kilowatt hour to $6.52 at 100 kilowatt hour. A minimum net monthly bill of $4.80 up to 20 kilowatt hour and 3 cents net per kilowatt hour for all energy over 20 kilowatt hour would provide revenue equal to costs at a monthly consumption of 50 kilowatt hour per farm. If one-half the fixed capital charges were met out of general provincial revenues the monthly cost chargeable in the user's bill would be reduced by $1.44. The bonus would be equivalent to $17.28 per farm customer per year; and, at the end of ten years with 30,000 farms connected would, in the aggregate, amount to $518,400 a year. If all fixed capital charges were shared between the provincial and local governments the monthly cost chargeable in the user's bill would be reduced by $2.88 per month.

Construction costs, capital charges, and operating expenses per farm could be reduced if the areas served were restricted on the basis of potential customers per mile. It is estimated that if an initial 1.75 customers per mile were required, construction costs might be reduced to approximately $500 per farm, and that 10,000 farms might be connected on this basis. Under these conditions lower operating expenses, higher consumption per farm, and more rapid increase in load would also influence the rates necessary to cover costs.

CHAPTER VII. FARM ELECTRIFICATION IN ALBERTA: SOME FURTHER CONSIDERATIONS

This chapter refers to a number of matters, not dealt with earlier in the Report or merely touched on in passing, which are important to farm electrification. These include additional costs to farm users for wiring buildings and installing appliances and equipment; net costs to farm users; non-farm rural users; tenant farmers; "self-help"; arrears, disconnections, and bad debts; education and promotion; and individual farm plants.

CHAPTER I

CENTRAL ELECTRIC STATION POWER IN ALBERTA

The purpose of this chapter is to provide a general description of the power resources, facilities for generating and distributing power, and consumption of power in the Province of Alberta. The first section refers to the various sources of power in the Province. The second section describes the generating plants and existing transmission systems. The types of service provided and the consumption of electric energy in different uses are dealt with in the third section.

SOURCES OF POWER IN THE PROVINCE OF ALBERTA.--The Province of Alberta is generously endowed with sources of electric energy, and therefore deficiency in sources of power is not a factor limiting desirable developments.

Table 1.--Potential and Developed Water Power in Canada[1]

Province	Available 24 hour Power at 80% Efficiency		Turbine Installation December 31	
	At Ordinary Minimum Flow	At Ordinary Six Months Flow	1941	1942
	H.P.	H.P.	H.P.	H.P.
Prince Edward Island	3,000	5,300	2,617	2,617
Nova Scotia	20,800	128,300	139,217	143,717
New Brunswick	68,600	169,100	133,347	133,347
Quebec	8,459,000	13,064,000	4,556,943	4,839,543
Ontario	5,330,000	6,940,000	2,617,495	2,684,395
Manitoba	3,309,000	5,344,500	420,925	420,925
Saskatchewan	542,000	1,082,000	90,835	90,835
Alberta	390,000	1,049,500	71,997	94,997
British Columbia	7,023,000	10,998,000	788,763	792,563
Yukon & Northwest Territories	294,000	731,000	22,899	22,899
Canada	25,439,400	39,511,700	8,845,038	9,225,838

[1] Source: Central Electric Stations in Canada, p. 6. Census of Industry, 1941. Dominion Bureau of Statistics, 1943.

Available estimates of potential water power in the Province shown in the above table (Table 1) are based on power sites which have been investigated.

These estimates suggest that, in comparison with the other larger provinces of the Dominion, the potential water power in Alberta is relatively small, and less than one-quarter of the power already developed in the Province of Quebec. However, a comparison of present turbine installation with the estimate of potential power indicates the possibility of substantial further development.

It should be pointed out that while the official estimates are based on the best available information, it is improbable that they provide any very reliable measure of the hydraulic power which the waters of the Province of Alberta, or of the other provinces, are capable of developing. In many cases the records on which estimates have been made are suspect because of the short period of time over which the records have been kept. For this reason the estimates may be too high or too low. Further, the capacity of many potential sites has not been investigated; and, even where estimates have been made, these are based only on the actual head possible of concentration at any site. The construction of storage basins and other regulating works would greatly increase the potential. It is therefore reasonable to suppose that the actual potential water power in Alberta is considerably in excess of that suggested by current official estimates.

The following is a list of power sites which have been investigated. and on which reports are available. Estimates of power possibilities at these sites are included in the official estimate of aggregate potential water power in the Province.

Athabaska River, Power Possibilities of the, M.C. Hendry (104), 1914
Athabaska River, Power Possibilities of the, M.C. Hendry (115), 1914
Jasper and Brule Lakes, Storage Possibilities of, M.C. Hendry (107), 1914
Beaverhill Lake, Storage Possibilities of, C. H. Attwood (202), 1915
Jackfish Lake, Storage Possibilities of, C. H. Attwood (203), 1915
Gull Lake, Storage Possibilities of, C. H. Attwood (204), 1915

North Saskatchewan River at Kootenay Plains, Storage Possibilities of, C. H. Attwood (207), 1915
Red Deer River at the Canyon Power Site, Power Possibilities of, C. H. Attwood (212), 1915
Brazeau River, Proposed Hydro-Electric Development Scheme on the, C. H. Attwood (216), 1915
Rocky Rapids, North Saskatchewan River, Reports on
G. M. McLaren (133), 1910
M. C. Hendry (45), 1912
C. H. Attwood (125), 1914
C. H. and P. H. Mitchell (132), 1914
Edmonton Power Company (292), 1917
Spray River Power Project. Engineering Department, Hydro-Electric Power Commission of Ontario, 1924.

There are also available various reports on Water Resources Inventory: Undeveloped Power Sites (Water Power Branch, Department of Interior), and reports on Rivers (Water Power Branch, Department of Interior). The Reports on Rivers are generally of a later date than the Water Resources Inventory, and contain information on water supply, run-off records, storage, ice conditions, power available, sites, market for power, and sources of data.

Red Deer River. $5CC_1$. 1918.

Location, 38-26-W4. Ordinary Minimum Flow -- 1,616 H.P.
Maximum Development ----10,130 H.P.

Brazeau River. $5DD_1$ and $5DD_2$. 1918.

$5DD_1$. Location, above Job Creek. Ordinary Minimum Flow -- 1,800 H.P.
Maximum Development ---- 5,450 H.P.

$5DD_2$. Location, Mouth of Southesk. Ordinary Minimum Flow -- 560 H.P.
Maximum Development ---- 1,700 H.P.

Sturgeon River. $5EA_1$. 1918.

Location, Fort Saskatchewan. Ordinary Minimum Flow -- 68 H.P.
Maximum Development ---- 200 H.P.

Athabaska River. $7AA_1$, $7AD_1$, $7AE_1$, $7CC_1$, $7CC_2$. 1918

$7AA_1$. Location, Athabaska Falls. Ordinary Minimum Flow -- 545 H.P.
Maximum Development ---- 2,450 H.P.

$7AD_1$. Location, 56-21-W5. Ordinary Minimum Flow -- 3,250 H.P.
Maximum Development ---- 9,500 H.P.

$7AE_1$. Location, 58-21-W5. Ordinary Minimum Flow -- 6,200 H.P.
Maximum Development ----18,200 H.P.

$7CC_1$. Location, Grand Rapids.	Ordinary Minimum Flow -- 9,400 H.P. Maximum Development ----32,700 H.P.
$7CC_2$. Location, Grande Rapids and Fort McMurray.	Ordinary Minimum Flow --78,400 H.P. Maximum Development ---272,700 H.P.

Snake Indian River. 7AB1. 1924.

Location, Stony Falls.	Ordinary Minimum Flow.--- 680 H.P. Maximum Development -----1,700 H.P. (Ordinary 6-month)

Clearwater River. $7CD_1$, $7CD_2$, $7CD_3$. 1919.

$7CD_1$. Location, Cascades.	Ordinary Minimum Flow -- 1,830 H.P. Maximum Development ---- 5,500 H.P. (Ordinary 6-month)
7CD. Location, Aux Pius.	Ordinary Minimum Flow.-- 713 H.P. Maximum Development ---- 2,138 H.P.
$7CD_3$. Location, Whitemud.	Ordinary Minimum Flow -- 1,380 H.P. Maximum Development ---- 4,175 H.P.

Peace River. $7JF_1$. 1924.

Location, Vermilion Chutes.	Ordinary Minimum Flow.--24,500 H.P. Maximum Development ----68,200 H.P.

Slave River. 7NB1, 7NB2. 1922.

$7NB_1$. Location, Pelican Rapid.	Ordinary Minimum Flow -142,500 H.P. Maximum Development ---324,000 H.P.
$7NB_2$. Location, Mountain Rapid.	Ordinary Minimum Flow - 80,000 H.P. Maximum Development ---182,000 H.P.

North Saskatchewan River. $5DE_1$. 1923.

Location, 48-8-W5.	Ordinary Minimum Flow.-- 7,960 H.P. Maximum Development ----33,080 H.P. (Ordinary 6-month)

It will be seen that most of the available reports are of an early date Flow records are, in most cases, inadequate, and generally speaking the reports do not suggest that the sites were suitable for development at the time the reports were prepared. Even though the development of these sites might not appear to be justified at the present time, it seems desirable that further investigation of their possibilities should be undertaken; and that immediate steps should be taken to accumulate adequate records of flow.

If extensive irrigation developments should be undertaken in the post-war years, it is possible that some of these might provide new sources of power. Most of the likely projects are in the south of the Province; and it seems probable that action will be taken in the case of the St. Mary and Milk River Project. The actual power available from such projects may not be greatly in excess of the amount required for pumping, but any excess power could be used for local electrification. The most elaborate scheme under consideration is the Clearwater-Red Deer Project, commonly referred to as the William Pearce Scheme. Information on the project, which is still under investigation, is difficult to secure; but it appears that, if undertaken, the development would provide for a large expansion of power capacity, although the supply would be highly seasonal.

For the steam plant Alberta has exceptionally large stocks of coal. Exhaustion of the supply is not a present consideration. The other requisite of the steam plant is a supply of cold water for condensing. This has generally led to plants being built beside a river or lake. However by means of cooling ponds or towers the condencing water requirements may be considerably lessened. It is not possible with the steam plant to say that a definite horsepower is available at a certain site, as the size of plant would be determined by the load to be supplied. Economic considerations account for the common practice of transporting coal to the plant near the centre where power is to be used, rather than building the plant at the mine head. Water supplies may also affect the location of coal-fired plants. Since coal fields are well distributed over the southern half of the Province, coal can be used in power generation in any of the large centres of population there.

On the other hand coal is not conveniently located to the population centres in the Peace River District.

The other common fuel for boiler heating is natural gas. Some electricity has been generated from gas fired boilers but the major use of gas has been in industrial plants and for heating. The reserves have been variously estimated, and further investigation may uncover new fields.

Oil may be used as a fuel for the steam boiler or may be used in the internal combustion engine. Alberta, compared with the rest of Canada, has large known supplies of oil and may have other as yet unknown fields. Competitive uses for oil in the motor car, aeroplane, tractor, etc., have limited its use for electric power generation. However certain low grade products of the refinery are used in boiler firing, and diesel driven units generate power in communities in which diesel fuel has advantages over alternative sources of power.

Wind power is available for certain localities where other sources of power are lacking. Generally it has been developed on the basis of the individual plant, though recently in the State of Vermont a 1,000 kilowatt unit was installed for commercial purposes. The expected performance was full load for one-fourth of the time, and part load for half the time.

The foregoing part of this Report serves to indicate that power can be produced in this Province to serve a farm electrification programme. It is rather surprising to note that generation of electrical power uses only a small part of the energy consumed by a community. It was estimated that 1/42 of the total energy consumed in the United States in 1939 was used in power generation. Heating and manufacturing processes use the bulk of the energy consumed.

POWER DEVELOPED IN ALBERTA.--Power Plants in Operation.-Table 1 indicates present hydraulic turbine installations totalling 94,997 horsepower. This appears to be made up of the plants listed in Table 2.

Table 2.--Location, Ownership, and Capacity of Hydro-Electric Plants

Location	Owner of Plant	Horsepower Capacity
Cascade, Anthracite	Calgary Power Company	23,000
Kananaskis, Seebe	Calgary Power Company	12,000
Horseshoe, Ozoda	Calgary Power Company	20,000
Ghost, Ghost River	Calgary Power Company	36,000
Lake Louise Creek	Canadian Pacific Railway	800
Bow River, Bassano	Canadian Pacific Railway	180
Cascade, Bankhead	Dominion Government	960
Elbow, near Calgary	City of Calgary	1,065
Bow River, Calgary	Calgary Water Power Company	780
Blindman, Blackfalds	Town of Lacombe	200
Prairie Creek, Strachan	G. L. Gabler & Son	12
		94,997

As the smaller plants are either no longer in existence, inactive, or inaccessible for electrification, for purposes of this Report the existing hydro-generating facilities are substantially those of the Calgary Power Company.

In the following Table (Table 3) plants operating in Alberta during 1941 are classified first into steam or hydro plants, and secondly according as they generate, generate and buy, or buy power only. The plants buying power only, are not included in the first classification.

Table 3.--Plants Operating in Alberta, 1941[1]

	Generating Stations			Generating and Non-Generating Plants			
					Generating and Buying: Power	Buying: Power Only	Auxiliary Plants
Ownership	Hydro: No.	Fuel: No.	Total: No.	Generating Only: No.	No.	No.	No.
Commercial	4	58	62	53	9	2	8
Municipal	-	10	10	8	2	5	-
Total	4	68	72	61	11	7	8

[1]Source: Central Electric Stations in Canada, p 18. Census of Industry, 1941 Dominion Bureau of Statistics, 1942.

Table 2 shows 68 fuel burning plants operating in Alberta in 1941. Further information from the Report on Central Electric Stations in Canada, 1941, indicates that 54 of these plants had gas and oil engines only, and that the total primary horsepower of gas and oil engines was 5,887 horsepower. Commercial steam-driven generating equipment was rated at 24,071 horsepower; and municipal steam-driven equipment had a capacity of 67,085 horsepower.

The total reported generating capacity was therefore as follows:

Hydro Electric	94,997 H. P.
Commercial Steam	24,071 H. P.
Municipal Steam	67,085 H. P.
Gas and Oil Engines	5,887 H. P.
Total	192,040 H. P.

Allowing for changes which may have occurred since 1941; there appears to be about 190,000 horsepower of generating capacity in the Province. This figure will be increased by 20,000 horsepower on completion of the present extension programme at the Edmonton City Power Plant. On the basis of 190,000 horsepower, and assuming 1 horsepower per farm, generating capacity required for 30,000 farms would represent about 16% of present total primary power installation.

Fuel burning plants include:

Edmonton	45,500 H. P.
Lethbridge	14,000 H. P.
Medicine Hat	7,240 H. P.
Drumheller	8,000 H. P.
Grande Prairie	1,300 H. P.
Peace River) Athabasca) McLennan)	600 H. P.

The Edmonton, Lethbridge, and Medicine Hat Plants are municipally owned. The Drumheller and Grande Prairie Plants are the property of Canadian Utilities Limited. Dominion Electric Power Limited owns the

Plants at Peace River, Athabasca, and McLennan. Other commercial plants are small.

Electrical Energy Generated.--Generating stations fall into three main groups:

(1) The commercial hydro plants.

(2) The commercial fuel burning plants.

(3) The municipal fuel burning plants.

The following table (Table 4) shows the power generated by each group.

Table 4.--Power Generated, by Type of Plant, 1941

Type of Generating Plant	No. of Plants	Total Kwhr Generated	Average Kwhr Generated per Plant[1]
	No.	Kwhr	Kwhr
Commercial Hydro	4	178,980,000	44,745,000
Commercial Fuel	58	15,515,000	267,500
Municipal Fuel	10	124,819,000	12,481,900
All Plants	72	319,743,000[2]	4,440,875

[1] Source: Central Electric Stations in Canada, p. 39. Census of Industry, 1941. Dominion Bureau of Statistics, 1943.
[2] Includes 429,000 Kilowatt hour reported as generated in municipal hydraulic plants.

As a result of the extensive coal and petroleum deposits in Alberta, approximately 44% of the total electric energy generated in the Province is derived from fuel, mainly coal, oil, and natural gas. In comparison with most other provinces this is a relatively high proportion which reflects the competition between hydraulic power and alternative sources. In two provinces sources of hydro-electric power are either absent or inaccessible. Thus in Saskatchewan all energy is obtained from fuel plants, and Prince Edward Island obtains all but 4% of its electric energy from fuel. In Nova Scotia and New Brunswick the proportions are roughly one-third and one-fifth from fuel. These provinces likewise are

handicapped by limited sources of hydraulic power, and the Province of Nova Scotia has substantial coal deposits. In all other provinces fuel is an almost negligible source of energy. Water power sites are readily accessible and, in some cases, fuels are relatively expensive. Coal and oil are both cheap in British Columbia but water power sites are well distributed in relation to population and industrial centres.

The quantities and calculated average prices of fuels used in central electric stations in Alberta in 1941 are shown in the table below (Table 5).

Table 5.--Fuel Consumption in Central Electric Stations, Alberta, 1941[1]

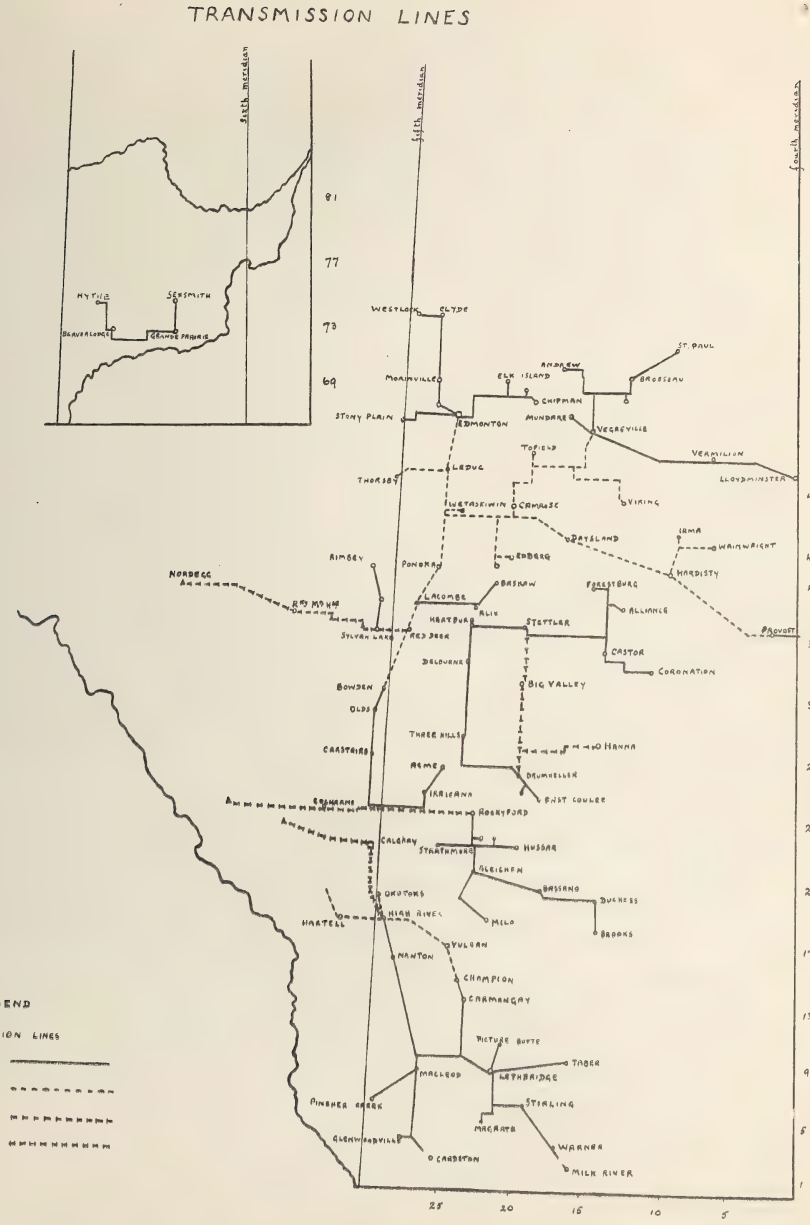
Type of Fuel		Quantity	Total Value	Calculated Average Price per Unit
			$	$
Bituminous Coal	Tons	26,425	26,885	1.02
Lignite Coal	Tons	145,206	267,786	1.85
Gasoline	Gals.	6,821	1,388	0.203
Kerosene	Gals.	4,812	957	0.199
Fuel and Diesel Oil	Gals.	404,202	54,917	0.136
Manufactured Gas	1,000 Cu. Ft.	818	156	0.191
Natural Gas	1,000 Cu. Ft.	633,746	46,712	0.074

[1] Source: Central Electric Stations in Canada, p. 40. Census of Industry, 1941. Dominion Bureau of Statistics, 1943.

Transmission Systems.--The main transmission systems in the Province are those operated by the Calgary Power Company and Canadian Utilities Limited. The location of high voltage transmission lines is shown in Figure 1.

Lines of the Calgary Power Company extend south from Calgary through High River to Macleod and practically to Cardston, with a branch line from Macleod to Pincher Creek connecting there with the system of the East Kootenay Power Company; and again through High River to Lethbridge and south to Milk River, with a branch east

Figure I


TRANSMISSION LINES
Sixth meridian
Fourth meridian
HYTHE
SEXSMITH
BEAVERLODGE
GRANDE PRAIRIE
WESTLOCK
CLYDE
ANDREW
ST. PAUL
BRUSSEAU
MORINVILLE
ELK ISLAND
CHIPMAN
STONY PLAIN
EDMONTON
MUNDARE
VEGREVILLE
TOFIELD
VERMILION
LLOYDMINSTER
THORSBY
LEDUC
WETASKIWIN
CAMROSE
VIKING
DAYSLAND
IRMA
WAINWRIGHT
HARDISTY
RIMBEY
PONOKA
EDBERG
NORDEGG
RED MDH
LACOMBE
BASHAW
FORESTBURG
ALLIANCE
SYLVAN LAKE
RED DEER
ALIX
HEATBURG
STETTLER
PROVOST
CASTOR
DELBURNE
CORONATION
BOWDEN
BIG VALLEY
OLDS
THREE HILLS
HANNA
CARSTAIRS
ACME
DRUMHELLER
IRRICANA
EAST COULEE
BANFF
ROSEMARY
CALGARY
STRATHMORE
HUSSAR
CLEICHEN
OKOTOKS
BASSANO
DUCHESS
HIGH RIVER
HARTELL
MELLO
BROOKS
VULCAN
NANTON
CHAMPION
CHAMPAGNY
PICTURE BUTTE
TABER
MACLEOD
LETHBRIDGE
PINCHER CREEK
STIRLING
MACARTH
GLENWOODVILLE
WARNER
CARDSTON
MILK RIVER
81
77
73
69
63
59
55
51
47
43
41
37
33
29
25
21
17
13
9
5
1
25
20
15
10
5
LEGEND
TRANSMISSION LINES
13000 volts
23000 volts
33000 volts
66000 volts

from Lethbridge to Taber. Centres of population east of Calgary are served with a line running due east from the plant to Rockyford and from there south and east as far as Brooks. To the north a line follows the main road from Calgary to Edmonton. A spur from this line extends west to Nordegg with a branch north to Rimbey. The other main branch from the line to Edmonton runs east from Wetaskiwin, through Camrose and Hardisty, and as far as Macklin, Saskatchewan. Diversions from this branch take power north to Tofield and Viking, with an interconnection with the Vegreville system of Canadian Utilities Limited; and again north from Hardisty to Irma and Wainwright. At Edmonton lines of the Calgary Power Company run east to Chipman, west to Stony Plain, and north to Clyde and Westlock. The voltage of most of the lines of the Calgary Power Company is either 22,000 or 13,200 volts. In the south of the Province these lines parallel a 66,000 volt line to Lethbridge and Pincher Creek; and a line of similar voltage connects the generating plant with Rockyford. A direct line (120,000 volts) connects the City of Edmonton with the Ghost Power Plant.

Canadian Utilities Limited operate three transmission systems, namely, the Drumheller, Vegreville, and Grande Prairie systems. The Drumheller system includes 33,000 volt lines extending north to Stettler and east to Hanna; and 13,800 volt lines from Drumheller to East Coulee, Drumheller to Trochu, and Stettler to Forestburg in the north and Coronation in the east. The Vegreville system (13,800 volts) is connected with the Calgary Power Company Line north of Holden, and serves towns lying between Mundare and Lloydminster, and between Andrew and St. Paul. The generating plant in the Grande Prairie system is at Grande Prairie, and lines (13,800 volts) extend to Sexsmith and Hythe.

Reference is made later to the extent to which these systems of transmission lines could serve, through the extension of low voltage farm distribution lines from them, the more densely settled farming areas of the Province.

Centres Served with Electricity.--Nineteen incorporated places have no electric service; but at least 126 unincorporated hamlets are served (Table 6.)

Table 6.--Centres Served with Electricity, by Type of Utility, 1942[1]

	Calgary Power Company	Canadian Utilities Limited	Municipal	Independent	Total
	No.	No.	No.	No.	No.
Hamlets	72	19	--	35	126
Villages	64	32	3	24	123
Towns	33	10	4	5	52
Cities	3	1	3	--	7
Total	172	62	10	64	308

[1]Source: Annual Report of the Electricity and Gas Inspection Services for the fiscal year ending March 31, 1942. Department of Trade and Commerce, Ottawa.

Information for towns, villages, and hamlets served by Calgary Power Company and Canadian Utilities Limited was sorted according to the size of the centre served measured by the number of consumers; and some data on consumption of electricity, and on rates, are shown in the accompanying table (Table 7).

Table 7.--Average Consumption and Rates in Centres other than Cities Served with Electricity by Calgary Power Company and Canadian Utilities Limited Grouped according to the Number of Consumers, 1942[1]

Type of Community	Number of Consumers	Number of Communities Included	Average Kwhr per Community	Average Number of Consumers	Average Annual Consumer	Average Rate per Kwhr
	No	No	Kwhr	No	Kwhr	Cents
Towns	Over 400	8	766,554	532	1,439	4.79
	300-399	6	369,267	343	1,076	5.80
	200-299	6	278,909	270	1,033	5.80
	100-199	11	165,268	159	1,039	6.12
Villages	Over 200	5	215,171	235	916	6.00
	100-199	21	122,949	125	993	6.38
	50-99	39	59,213	74	798	7.60
	25-49	21	30,148	42	720	8.24
	10-24	2	8,760	14	626	9.10
Hamlets	Over 100	4	184,285	168	1,095	5.87
	50-99	3	48,625	66	737	7.69
	25-49	17	23,934	31	769	8.09
	10-24	14	13,181	17	756	9.00
	Less than 10	22	3,340	5	639	10.04

[1]Source: Assessment Branch, Department of Municipal Affairs.

It will be seen that the consumption of electricity per customer tends to decrease as the size of the community becomes smaller. On the other hand rates are higher in the smaller localities. The presence of one or more large-scale consumers in a community will tend to raise the average consumption per customer, and also to bring down the average rate. Individual cases may depart considerably from the average as a result of the presence or absence of large industrial or commercial users.

TYPES OF SERVICE AND USES.--Electricity may be sold for (a) domestic, (b) commercial lighting, (c) industrial, (d) railway, or (e) street lighting use. The proportions taken by each use will vary in different countries, or in different parts of the same country. Railway refers either to street railway or electrified railroads. Large sections of the country will have no consumption of electricity for this purpose.

Some proportions are given in the accompanying table (Table 8) for the larger classes of users. The information in this table was derived from the central Electric Stations of Canada Census for 1941, and the street railway customer is apparently included in the power consumer group.

In 1940 the ratio of domestic consumption to that of consumption by large and small power consumers was about one to four for the whole of the United States. Rural customers that year used about one-seventh as much as the urban domestic customers. The domestic load proportion varies with the degree of industrialization.

The table shows fairly wide variations in the proportions of power used in various classes of service, but generally indicates that the domestic load is much smaller than the power load but makes up a larger proportion in the less densely populated and less industrialized sections

Table 8.--Distribution of Electricity to the Principal Uses, 1941[1]

	Total Kwhr[2]	Domestic		Commercial Light		Power		Losses	
	Kwhr	Kwhr	%	Kwhr	%	Kwhr	%	Kwhr	%
Canada	30,964,104	2,582,405	8.3	1,309,254	9.2	23,459,193	75.9	3,324,174	10.7
Nova Scotia	480,177	48,357	9.9	31,436	6.5	341,416	70.8	53,530	11.0
Prince Edward Island	11,869	3,483	29 3	2,484	20.9	3,996	21 5	1,524	12 7
New Brunswick	515,215	31,234	6 0	23,201	4 5	431,703	85.7	24,892	4.8
Quebec	13,444,151	342,626	2 5	325,020	2.4	12,540,057	93.4	1,128,005	8.4
Ontario	11,598,190	1,546,189	13.4	650,326	5.6	7,755,193	67.0	1,540,996	13.3
Manitoba	1,926,011	343,041	17.8	90,534	4.7	1,250,536	64.9	219,167	11.4
Saskatchewan	196,378	45,448	23.2	34,692	17.6	89,561	45.6	18,718	9.6
Alberta	322,688	47,573	14.8	40,947	12.7	169,096	52.4	52,644	16.3
British Columbia	2,469,425	174,454	7.1	110,614	4.5	1,877,635	76.1	284,698	11.5

[1] Source: Central Electric Stations in Canada, p. 38. Census of Industry, 1941. Dominion Bureau of Statistics, 1943. Some small uses have been omitted from the table.

[2] Kwhr figures are in thousands.

The different classes of customers require different types of service. The domestic customer is served at the utilization voltage with the supplier bringing the wires directly to the user's premises at 110 volts or at 110-220 volts. As the larger customers are reached the voltage will be higher, and three phase power will be supplied. Power may then be brought in at a higher voltage and be stepped down on the premises to the utilization voltage. The large consumer may furnish his own transformers and purchase power at transmission voltages. The extra losses and equipment required for the low voltage domestic service as well as the small consumption per customer is reflected in the higher rates that usually obtain for domestic service.

SUMMARY.--(1) Sources of power do not limit the undertaking of desirable developments. The Province of Alberta is generously endowed with power resources in water, coal, gas, and oil.

(2) The installed capacity for primary power approximates 190,000 horsepower; and about 320 million kwhr were generated in 1941. Since 1941 energy generated has expanded considerably. If a farm programme required one horsepower per farm, farm electrification requirements for 30,000 farms would represent about 16 per cent. of the total primary power installation.

(3) Transmission lines traverse most of the established area and more densely settled rural areas, indicating that a large proportion of farms in the Province could be served off existing transmission lines.

(4) Only 19 incorporated places in the Province are not served with power, and 126 hamlets have power.

(5) Consideration of the uses of electric energy emphasizes the small proportion used for domestic purposes. The relative importance of different uses is affected by the degree of industrialization, and perhaps also by the rate schedule.

CHAPTER II

THE PRESENT STATE OF FARM ELECTRIFICATION IN ALBERTA AND DEVELOPMENTS ELSEWHERE

This chapter describes the present state of farm electrification in the Province of Alberta; and the reasons for the lag in the provision of central electric station power to farms are discussed. The second part of the chapter refers to developments in farm electrification in other provinces of the Dominion and in the United States. The principal reasons for the more rapid extension of farm electrification in some rural areas are indicated.

THE PRESENT STATE OF FARM ELECTRIFICATION IN ALBERTA.-Preliminary data from the 1941 Census of Canada, based on a 10% sample, indicate that about 5.5% of the farms in the Province of Alberta may have been electrified in 1941. Information made available by the Deputy Minister of Trade and Industry, Edmonton, showed 505 farms served with central electric station power. From this evidence it appears that in addition approximately 5,000 farms have individual electric plants of the gasoline engine or wind charged varieties. This figure corresponds closely to rough estimates secured from distributors of individual plants.

Complete information on the distribution of individual plants throughout the Province is not available. The following table (Table 9) shows the number of farms served with central electric station power, and the utilities providing the service.

Table 9--Farms Served with Central Electric Station Power in Alberta[1]

Utility	Number of Farms Served
	No.
Calgary Power Company	372
Canadian Utilities Limited	60
City of Lethbridge	34
City of Calgary	22
City of Edmonton	5
Forest Lawn Power and Light Company	3
City of Medicine Hat	2
City of Red Deer	2
Town of Ponoka	2
Town of Vermilion	2
Town of Macleod	1
	505

[1]From Report of Manitoba Electrification Enquiry Commission. Source of Data: W. D. King, Deputy Minister of Trade and Industry, Edmonton.

As already pointed out electric energy is available to industrial, commercial, and domestic users in all but 19 of the incorporated places in the Province of Alberta, and more than 120 unincorporated places are served with power. Although many households, especially in the smaller centres may not use power, the proportion of non farm homes which are electrified must be quite high; and is certainly high relative to the proportion of farms with electricity. The substantial difference in the degree of electrification of urban and rural homes is characteristic of most regions of the North American continent; and, if the proportion of farms electrified is lower in Alberta than in any other Canadian Province excepting Saskatchewan there have been, in the past, substantial reasons for this.

The basic reasons for the general tendency for the provision of central electric station power to farms to lag behind electrification of urban plants, stores and homes, are simple and obvious, namely, small individual users, high distribution costs with a large element of risk, and relatively low cash incomes of farm people.

The probable consumption of energy by Alberta farms is discussed in detail later, and evidence from other sources is presented. At this stage it may be sufficient to point out that the estimates and proposals of the Manitoba Electrification Enquiry Commission were based on the assumption of an average consumption of 600 kwhr per farm per year. The total consumption of power in Alberta in 1941 (excluding line losses) was 270,044,000 kwhr. The addition of 30,000 farms with an average of 600 kwhr per year would increase the annual consumption by less than 7%.

Costs of providing service to farm users are relatively high because of three factors. First, distance between farms makes for relatively high line construction costs per farm; second, distance between farms results in relatively high operating costs in patrolling lines, meter reading, etc.; and third, the risk carried by the utility providing power to scattered farm users is also relatively great.

Until recently the standard quotation for the construction of farm distribution lines was $1,000 per mile. The following information obtained through the courtesy of a small cooperative light and power organization shows that even where line construction has been undertaken on a 'self help' basis, construction costs have been substantial. In this case the total costs incurred in constructing four miles of line were $2,399.91, including $2,074.04 for materials. Two factors made for relatively low costs in comparison with the standard $1,000.00 First, the members provided a considerable amount of labour. Second, the organization was able to secure poles, from the municipal utility from which the power was to be bought, at less than one-half the usual price. As in this case the poles were spaced 150 feet apart this meant a

considerable reduction in the cost of materials.

The relation between distance between farms and costs of patrolling and meter reading is obvious. If farm lines are to receive the same attention, and meters read monthly, the operating costs on rural lines must be considerably higher than in cities.

With high construction costs per connection, the risk to the utility in extending services to single farm users or to small group of farm users is considerable. In some cases, farmers have discontinued using power. Even the customary procedure of requiring the user to pay over a period of years, part of the construction costs, while it greatly influences the cost of power to the user, does not entirely eliminate the risk to the utility. Farm customers, in some cases, have discontinued using power before the outlay could be recovered.

The two factors of small consumption per farm, and high costs of providing the service have been associated with power rates to farm users in excess of those charged to urban users. Quarterly rates to farm customers of the Calgary Power Company have been as follows:

First 90 kwhr per quarter	10 cents per kwhr
Next 60 kwhr per quarter	5 cents per kwhr
Next 450 kwhr per quarter	3 1/3 cents per kwhr
Excess kwhr	1 2/3 cents per kwhr
Minimum net rate	$9.00 per quarter

Despite the select group of farms served, and the relatively high consumption per customer (1,357 kwhr per year), the Company estimates a small deficit in serving its farm customers. Farmers served by Canadian Utilities Limited are mainly on a combination rate which is the same as that of the nearest village, except for the minimum bill. Monthly rates are usually as follows:

Demand charge	$2.00
First kwhr per month	7 cents per kwhr
Excess kwhr	3 cents per kwhr
Minimum net bill	$4.00 or $5.00 per month

The third factor limiting the extension of central electric station power to farms has been the relatively low and highly variable cash incomes of farm families. The estimates of net cash agricultural income in the following table (Table 10) represent the cash income available to all farm families in Alberta. Since 1926 the number of farms in Alberta has varied around 100,000. On the basis of this number of farms the average income per farm, over the period 1926-37, ranged from $165 in 1932 to $1,467 in 1928; the average for the 12-year period was $628. Cash incomes as low and as variable as those obtained by Alberta farmers in pre-war years could not, except in the case of a few farmers with relatively high and stable incomes, provide the capital required for the initial investment, or the cash to meet monthly bills.

Table 10.--Agricultural Income, Alberta, 1926-1937[1]

Year	Gross Cash Income	Estimated Cash Expenses	Net Cash Income	Index Net Cash Income 1926=100	Income in Kind	Net Income: Cash and Kind	Depreciation	Net Income After Depreciation
	(Millions of dollars)							
1926	161.0	55.2	105.8	100.0	23.2	128.9	14.4	114.5
1927	168.7	61.5	107.2	101.3	23.6	130.8	15.1	115.7
1928	210.8	64.1	146.7	138.7	25.2	171.8	15.9	155.9
1929	169.5	60.6	108.9	102.9	26.9	135.8	16.7	119.1
1930	93.5	61.9	31.6	29.9	35.1	56.7	17.5	39.2
1931	69.7	53.0	16.7	15.8	30.3	37.0	18.3	18.7
1932	67.2	50.7	16.5	15.6	17.4	33.9	17.3	16.6
1933	66.4	46.8	19.6	18.5	16.2	35.8	16.4	19.4
1934	92.8	49.3	43.5	41.1	17.5	61.1	15.4	45.7
1935	96.6	53.1	43.5	41.1	19.7	63.3	14.4	48.9
1936	91.5	43.3	46.2	43.7	19.6	65.7	13.5	52.3
1937	117.2	50.1	67.1	63.4	21.8	88.9	13.5	75.5

[1] Source: National Income. Appendix 4. Royal Commission on Dominion-Provincial Relations. Table IX-C, p. 90.

Under conditions of high distribution costs of central electric station power, high although not unreasonable rates, and low and variable cash incomes of farm families generally, larger and more prosperous farmers have, in some cases,

installed individual plants. The factors limiting the use of individual plants have been the substantial initial investment and the relatively limited service. The place of individual farm plants in any general scheme of farm electrification is discussed in more detail in a later part of this Report, and information on their use is provided. It may be sufficient to point out here that, although farmers with individual plants generally express satisfaction with the service they are getting, the electrification by this means of some 5% of the farms in the Province leaves the problem of farm electrification largely unsolved.

DEVELOPMENTS IN OTHER PROVINCES AND IN THE UNITED STATES.--The estimated proportion of farms electrified in each of the Canadian provinces is shown in Table 11.

Table 11.--Proportion of Farms Electrified and Average Size of Farm by Provinces

Province	Per Cent. Farms Electrified (1941)	Average Size of Farm (1931)
	%	Acres
Prince Edward Island	5.4	93
Nova Scotia	26.0	109
New Brunswick	18.5	122
Quebec	23.3	129
Ontario	37.0	119
Manitoba	7.3	279
Saskatchewan	4.7	408
Alberta	5.4	400
British Columbia	35.8	136

The table discloses that, in relation to farm electrification, the situation in the Prairie Provinces is notably different from that of other Canadian Provinces, with the exception of Prince Edward Island. There are two principal reasons for this difference, namely, the small number of potential users per mile of distribution line in the Prairie Provinces, and the assistance given to the distribution of power to farm users in other provinces.

The number of potential users per mile of line depends on the density and scatter of farms, and is closely related to the size of farm in the area served. A comparison of the average size of farm in the nine provinces suggests a much lower density of farms in the Prairie Provinces. It is true that the average size of farm in any province is not a wholly satisfactory measure of the density of potential users in the areas serviced in the provinces with a high proportion of farms electrified. In the first place, farm distribution systems are not generally extended into those areas where farms are large or scattered; and secondly, even within the general territory served there is usually some selection designed to maintain the number of users per mile of line. Some scattered information indicates more accurately the relatively high density of users in the Eastern Provinces. In 1941, the systems of the Ontario Hydro Commission consisted of 20,104 miles of primary rural distribution line, serving 131,524 hamlets and farm customers, including 71,817 farm users. This represented 6.5 hamlet and farm customers per mile, and 3.5 farm users per mile. Extensions will not be made by the Commission unless 2 or more users per mile are available. In rural systems the Shawinigan Power Company of Quebec has 5.88 customers per mile of line. In a typical district (Maugerville) in New Brunswick the number of customers per mile is about 6.5 In Nova Scotia assistance from general revenue is provided if the equivalent of three contracts of domestic classification per mile can be secured initially, and if there are also present enough potential customers to ensure, when connected, sufficient revenue to cover annual costs.

The second reason for the high proportion of farms electrified in some provinces is that assistance is given to farm services so

that rates charged are lower than is necessary to cover all costs. This factor may be illustrated by reference to Ontario and to the Province of Quebec.

In Ontario all farms electrified are served through the Ontario Hydro Electric Power Commission. The number of farms served in 1941 was 37% of all farms in the province. Saturation reached 54.3% in the Niagara System, 27.0% in the Eastern Ontario System, and 23.6% in the Georgian Bay System.

Assistance has been given to farm electrification in three ways:

> "First--A 'grant-in-aid' toward the intital capital cost of supplying electric service, amounting to 50% of the cost of line and secondary equipment necessary to deliver power from the supply point of the Commission's stations or of a city, town, village, etc., to the customer's property. .....
>
> "Second--Authority was granted to the Commission by the Province ..... to fix a maximum service charge for any class of service in a rural power district. Where, as may be the case in newly established rural power districts, such maximum service charge is not sufficient to meet the necessary cost of service, as specified by the Commission, the deficit is chargeable to and payable out of the Consolidated Revenue Fund of the Province. Payments made out of the Consolidated Revenue Fund for this purpose, on account of any rural power district, are charged to that rural power district in a special account ..... in the books of the Treasurer of Ontario, and any surplus thereafter arising from any maximum service charge in that rural power district is paid to the Treasurer of Ontario and placed to the credit of the rural power district in such suspense account until the deficit is wiped out. .....
>
> "Third--An Act ..... to provide for granting aid towards the installation of electrical works in rural power districts was passed in 1930 ..... Aid may be granted for the wiring from the transmission or distribution lines of the Commission into and throughout dwellings, farm outhouses, and any other works which may from time to time be specified by the regulations. In addition to the wiring, loans may be obtained on transformers, motors or other appliances, as may be necessary or expedient for any industrial, agricultural, or domestic purpose which may be specified in the regulations."1/

1/ Rural Electrical Service in Ontario. Progress Report and Rates for Service. The Hydro-Electric Power Commission of Ontario.

By the end of 1941, the Grant-in-aid amounted to $23,525,165, or $180 per customer. At the end of 1940, the Commission had advanced $386,000 for the purchase and installation of electrical appliances. In addition the exemption of the publicly owned utility from taxation permits a lowering of rates which has been a contributing factor in the successful operation of the rural power districts.

In this Province, therefore, the high proportion of farms serviced has been made possible, in part, by contributions from general provincial revenue.

In the Province of Quebec the large proportion of farms which are electrified is served by five private utilities. Of these the largest, in terms of number of farms served, is the Shawinigan Water and Power Company. At the end of 1942 this Company served 16,074 farm customers, or 33.6% of all farms in the district within which the Company operates. In a recent report prepared for the Shawinigan Company,[1/] the following statement is made. "On the basis of a yearly cost amounting to $40 per farmer, farm distribution in the territory served by 'Shawinigan' in 1941 cost some $635,000. Actually only $285,000 was received for this service. The low cost of farm service is 1941 within Shawinigan territory was, therefore, possible only because of a subsidy amounting to about $350,000 contributed by the Company." As the Company remained solvent despite its losses on farm distribution it is probably reasonable to assume either that the revenue from other services was sufficient to compensate for the loss on farm service, that is, that urban and industrial users were paying higher rates than they might otherwise have been charged; or, that a substantial part of

1/ Memorandum on Rural Electrification. Huet Massue. Statistical Engineer. The Shawinigan Water and Power Company.

the revenue spent to provide farm service would otherwise have been lost to the Company in taxes. These considerations do not, of course, explain why a private company should deliberately engage in unprofitable business; and it appears that this Company, along with others which have served farm users at a loss, has viewed farm electrification as a desirable public service and has accepted responsibility for the provision of the service within its territory.

The Manitoba Electrification Enquiry Commission, 1942.-- A Commission of Enquiry was appointed by the Government of Manitoba, in June 1942, "to investigate the present system of generating, transmitting and distributing electricity in Manitoba in order to ascertain whether economies cannot be effected by its reorganization which will enable the Manitoba Government to make available to Manitoba farmers a supply of electrical energy at a substantial reduction in its present cost without at the same time increasing the standard rates for such electricity to any citizen of Manitoba." The Commission presented an extensive report incorporating recommendations for a programme of farm electrification in the Province of Manitoba.[1/] The main features of this programme are outlined below.

The objective was set at 25,000 farms in ten years. There are approximately 59,000 farms in Manitoba. The number of farms already served with central electric station power is 1,100.

Capital expenditure involved in the programme was estimated to amount to some twenty million dollars, depending on saturation and

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1/ A Farm Electrification Programme. Report of Manitoba Electrification Enquiry Commission, 1942. King's Printer. Winnipeg. 1943

prices.[2/] Line requirements per farm were estimated to be 0.755 miles on the road allowance and 0.095 miles of service tap-off, or a total of 0.850 miles of line per farm; and construction costs were set at $729 per farm. To this latter figure were added additional rural network costs and miscellaneous costs bringing the average capital cost per farm to $798.17.

The Commission assumed an interest rate of 3½% and that an annual levy of 2.75% would provide the necessary sinking fund for depreciation and replacement. It was proposed that the provisions of the Manitoba Power Commission Act should apply to farm electrification. This Act provides for a bonus equal to the interest and sinking fund on one-half the capital. With this bonus the charge to be levied against the farm customer was assumed to be 3.125% of the capital cost, or $2.08 per farm per month. The amount of the bonus would therefore be $25 per farm per year.

Estimated operating expenses, other than the cost of energy were $1.99 per farm per month, making, with capital charges, a total of $4.07 per customer per month. The cost of energy delivered at the farm was based upon the provisions of the Manitoba Power Commission Act, and was taken to be 0.75 cents per kilowatt hour. Thus the cost of energy would be 37 cents per month for 50 kwhr, and 75 cents per month for 100 kwhr.

The Commission proposed a minimum net monthly bill of $3.60 (10% discount for prompt payment) and consumption rates of 8 cents per kwhr for the first 50 kwhr per month, and 2 cents for all additional energy per month. It was estimated that on this basis

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2/ The Manitoba Report offered four estimates based on (1) 80% saturation and 1939 prices; (2) 80% saturation and 1942 prices; (3) 60% saturation and 1939 prices; (4) 60% saturation and 1942 prices. The estimates referred to here are generally based on 60% saturation and 1942 prices.

revenue would equal costs with an average consumption of about 70 kwhr per month; if the share of the network costs were not charged against farm users under the scheme. With 80% saturation and 1939 prices it was estimated that the proposed rates would cover all costs, including the share of network costs, when monthly consumption increased to 90 kwhr.

The Commission estimated the cost of wiring the farm house and out-buildings at an average of $150 per farm; and stressed the importance of the prices of electrical appliances. It recommended "that the Province make arrangements to supply farmers with standard packages of appliances as near as possible at net cost. Unless all other methods fail, it is not recommended that the Province assume any financial liability with respect to sale of appliances, but merely that it act as an agent between the manufacturer and the farmer."

The Rural Electrification Administration, United States.--The Rural Electrification Administration, United States Department of Agriculture, was established in 1935 to make loans to assist in the distribution of electric energy to farm users. In addition to making loans, the R. E. A. assists in organizing cooperative local power districts, has been active in developing and promoting arrangements for reducing costs of distribution of power, and maintains supervision over the operations and finances of the local organizations. The expenses of administration amount to about $3,300,000 a year.

R. E. A. loans are made on the following 25-year amortization plan: "accumulation of interest for 30 months from the date of the note; payment of interest on accumulated interest and principal from 31 to 48 months; and payment of principal and interest from 49

months to the end of the 25-year period at an increasing monthly rate which varies from $3.00 per $1,000 during the period from 49 to 60 months, to approximately $5.35 per $1,000 after 85 months". 1/ Loans are made at an interest rate which is equal to the rate which the Federal Government has to pay on its borrowings of a maturity of ten years and over. Currently the rate is about 2.5%. The R. E. A. makes loans for building of lines, wiring buildings, buying appliances, and in some cases for building generating stations. Normally the cooperatives purchase power from existing utilities.

The operating history of the R. E. A. cooperatives reflect a very large measure of success. Progress in the extension of the systems is evident from the following table, (Table 12).

Table 12.--R. E. A. Consumers, Advances, and Energized Systems. Cumulative Totals.

As of End of Month	Funds Advanced	Energized Systems		Customers Connected
		Number	Miles	
	$			
June 1936	823,262	11	400	693
1937	11,864,836	45	8,000	19,611
1938	60,040,810	248	41,736	104,528
1939	122,339,824	417	115,230	268,000
1940	221,287,287	630	232,978	549,604
1941	296,395,142	732	307,769	779,561
1942	354,616,010	789	369,129	981,193
Dec. 1942	364,324,196	803	378,015	1,012,284

The following operating statistics (Table 13) throw further light on the successful performance recorded.

1/ **Allotment**, Construction, Operating and Financial Statistics of R. E. A. -- Financed Systems -- December 31, 1942. United States Department of Agriculture, Rural Eletrification Administration.

Table 13.--Operating Expenses of R. E. A.--Financed Systems by Age Groups. December 1942.

Age in Months	Systems Included	Consumers per mile	Kwhr per Consumer	Per Cent. Minimum Bills	Revenue per mile
	No.	No.	No.	%	$
1 - 12	49	2.31	51	35	7.29
13 - 24	138	2.35	55	33	9.13
25 - 36	286	2.36	60	29	9.59
37 - 48	229	2.60	71	26	11.14
49 and over	84	2.89	82	20	14.02

For the 12 months ending December 31, 1942, the total kwhr billed was 1,150,536,000, and total revenue $46,927,322. This represents an average of 4.08 cents per kwhr.

In interpreting the results of the R. E. A. programme two factors should be taken into consideration. First, the period over which the R. E. A. has been active has been one of buoyant farm incomes, during which private utilities, no doubt influenced by the competition of the cooperatives, have also considerably expanded the number of farm customers served. Second, the density of farms in the R. E. A. systems is generally greater than could be achieved in Alberta. Of the 803 systems operating in 1942, 168 had less than 2 customers per mile, and only 24 had less than 1.50 customers per mile.[1/] Twenty-four states had systems with fewer than 2 customers per mile; only 11 states had systems with fewer than 1.50 customers per mile. The states with systems having fewer than 1.50 customers per mile are listed below in Table 14.

1/ For estimates of number of customers per mile in Alberta, see p. 64.

Table 14.--R. E. A. Systems with Fewer than 2.00 and 1.50 Customers per Mile, 1942.

State	Number of Systems	Systems with Fewer than 2.00 Customers per Mile	Systems with Fewer than 1.50 Customers per Mile
	No.	No.	No.
Colorado	18	5	2
Idaho	9	3	1
Kansas	22	19	4
Minnesota	47	17	3
Montana	12	2	1
Nebraska	22	18	4
New Mexico	5	2	1
Oklahoma	23	13	1
Oregon	12	2	1
South Dakota	7	4	3
Washington	18	5	3

Trends in Farm Electrification in Canada and the United States.

The trend in farm electrification in Canada is indicated by the following table (Table 15).

Table 15.--Farm Electrification in Canada, 1931 and 1941

Province	Proportion of Farms Electrified[1] 1931	1941
	%	%
Prince Edward Island	3.5	5.4
Nova Scotia	8.3	26.0
New Brunswick	8.6	18.5
Quebec	13.2	23.3
Ontario	12.8	37.0
Manitoba	2.3	7.3
Saskatchewan	1.4	4.7
Alberta	1.7	5.4
British Columbia	21.8	35.8

1 In the three Prairie Provinces the large proportion of the farms electrified have individual plants. Less than 30% of the electrified farms in Manitoba have central station power. In Saskatchewan there are about 6,500 electrified farms; of these less than 300 have central station power. As pointed out elsewhere about 5,000 Alberta farms have individual plants; and about 500 have central station power. The situation is completely reversed in the other provinces.

The most pronounced progress has been made in Ontario, Nova Scotia, New Brunswick, and Quebec.

The following increases in farm electrification have occurred

in Western States during the period of activity of the Rural Electrification Administration (Table 16).

Table 16--Farm Electrification in Western States, 1934 to 1941

State	Proportion of Farms Electrified	
	1934	1941
	%	%
Colorado	11.2	39.0
Kansas	7.6	22.0
Wyoming	3.0	30.5
Nebraska	7.1	24.9
Iowa	14.4	50.9
Montana	5.5	24.0
South Dakota	3.5	8.3
North Dakota	2.3	6.4
Minnesota	6.8	35.1

Progress in farm electrification, where it has been most pronounced, has been associated with two principal factors. First, substantial reductions in the cost of construction of rural distribution lines, and in the provision of electric energy to farms. Second, an increased disposition to consider the electrification of farms as a desirable public service, and to promote the extension of farm electrification by providing a significant measure of assistance.

SUMMARY.--(1) Recent estimates indicate (a) that about 5.5% Alberta farms are electrified; (b) that 505 farms are served with central electric station power; and (c) that approximately 5,000 farms have individual plants.

(2) The main reasons for the lag in electrification of farms with central station power are (a) small individual users; (b) high distribution costs; and (c) relatively low and variable cash incomes of farm families.

(3) Where rates have been set to produce revenue close to costs, such rates have necessarily been higher than rates in towns and villages.

(4) Higher proportions of farms electrified in other provinces have been due to (a) greater density of farms and larger numbers of customers per mile than could be expected in the Prairie Provinces; and (b) rates which involved the utilities in substantial losses, the losses being covered either (i) in the case of private utilities, either by revenue from urban users or by reductions in taxes, or (ii) in the case of public utilities, by direct government contribution from general revenues.

(5) The Manitoba Electrification Enquiry Commission, 1942, recommended a government bonus equivalent to one-half the capital costs in order to provide for a programme of electrification of 25,000 farms in ten years.

(6) The Rural Electrification Administration in the United States has been successful in promoting local power cooperatives through the provision of funds at low rates of interest; but only 24 out of 803 schemes have less than 1.50 users per mile of line.

(7) Fairly rapid extension of farm electrification occurred in some Canadian Provinces and in some Western States in the period immediately before the war. This trend appears to be associated with two principal factors, (a) substantial reductions in the costs of construction and operation, and (b) an increased disposition to consider the electrification of farms as a desirable public service, and to promote the extension of farm electrification by providing a significant measure of assistance.

CHAPTER III

THE ALBERTA ENQUIRY: PRELIMINARY CONSIDERATIONS

In approaching the problem of farm electrification in Alberta decisions had to be made on three points. First, it was necessary to reach a tentative decision as to the scope of the survey, that is, the extent of farm electrification which might be considered. Second, if it did not appear desirable to consider, as an immediate possibility, the electrification of all farms in the Province, some tentative potential service area had to be outlined. Third, having decided on the scope of the survey it was necessary to consider whether, in the post-war years, sufficient power would be available or whether additional generating capacity would be required.

THE SCOPE OF THE SURVEY.--As already pointed out Census data indicate about 5.5% of all farms in Alberta are electrified; and only some 500 farms have central electric station power.

Current interest in rural electrification suggests that the preceding rate of extension of power to farm users has been slower than is now desired. A programme which failed to accelerate farm electrification would not be acceptable. On the other hand it does not appear reasonable, at this time, to plan a programme which would provide electric power to all farms in the Province. In the first place, where changes in techniques, demand for power, and costs of providing power are likely to occur, it is unwise to project plans too far into the unpredictable future. In the second place, the attempt to accomplish complete electrification in a short period of years would impose too heavy a burden.

At the conclusion of the war resources which are now scarce will be released from war-time uses. But many of the resources which might be used for rural electrification are capable of being used

for other purposes. The amount of resources required to provide rural users with power, when these resources could be used for other desirable objectives, represents the real cost of supplying the service. Consequently, before any programme of electrification can be justified, it is necessary to consider, first, the relative importance of the provision of power to rural users, and second, the extent of the resources required.

It is not possible to compare the relative importance which the community might attach to the use of resources for rural eletrification, housing and home improvement, water and sewage disposal, roads, health services, educational facilities, mechanization of farms, industrial development, and the thousand and one other desirable uses to which resources might be put in the post-war years. It can, however, be said that the advantages of rural electrification are great and widely recognized. These advantages accrue through the direct effect on the living conditions of rural people, and the indirect effect on the stability of rural population; through reduced expenses of production and the release of effort for other productive activity; and through farm and regional diversification with their stabilizing effect on the individual farmer and on the economy as a whole.

The real cost of supplying power varies considerably and could become excessive under an extensive scheme to be carried out in a short period of years. In terms of resources required per user the cost of making central electric power available depends on three principal factors. First, the cost depends upon the existing facilities for the generation, transmission, distribution and consumption of power. Subject to certain qualifications, the real cost of making power available to new users would be lowest where

existing generating capacity is adequate to meet the additional load, and existing transmission or distribution lines pass close to the farm.[1/] The second factor affecting cost is the location of potential users relative to existing sources of power. The third factor is the density and scatter of potential users within a given area.

The above considerations imply that costs per user will rise appreciably with a more extensive programme and that, even if considerable importance is attached to the provision of power to farms, there is a point beyond which the real costs might well be considered too great, that is, the resources required for further extension of rural electrification could, with greater advantage, be applied to other uses.

The suggestion that some limitation should be placed on the scope of any immediate programme may mean that public funds are to be employed for the benefit of some rural localities and people, and not for others. However this is a common feature of public expenditures; and, in connection with farm electrification the following points seem relevant. First, a given expenditure of public funds will serve the largest number of people when applied in those localities in which the costs per user are lowest. Second, there may be alternative forms of public expenditure which would prove more useful in the areas not served with central station power. For example, in areas in which the cost of transmission and distribution of power generated in central electric stations

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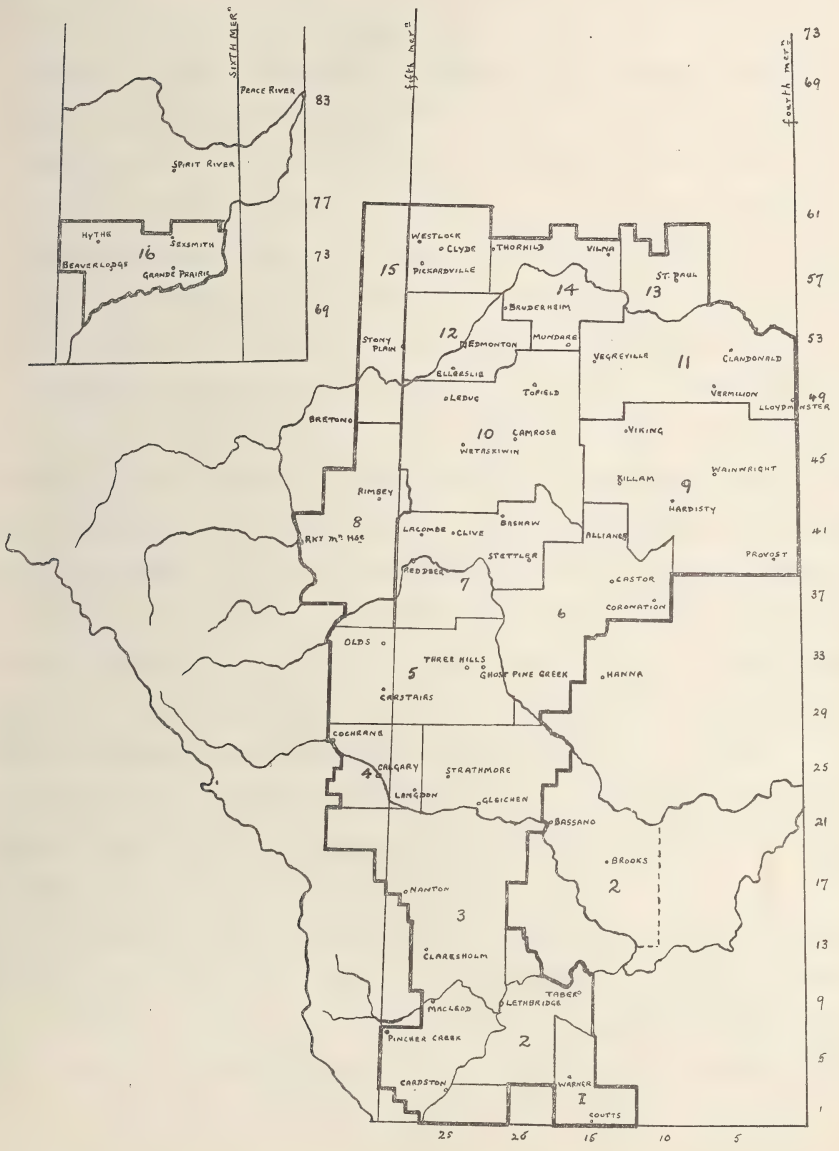
1/ The qualifications to be noted are: first, there may be in prospect alternative uses for the available power. In this event additional generating capacity and new transmission lines might have to be provided. Second, under some conditions of distance and alternative sources of power it might be more economical to provide new generating capacity. This would be true where the sum of the costs of generating and distributing from the new site were less than the additional costs of distributing from the existing facilities.

Figure 2

DISTRICTS IN THE POTENTIAL SERVICE AREA



appeared excessive, it might be feasible to assist in the installation of individual farm plants; or these communities might be more advantageously served with improved roads, irrigation developments, and other improvements.

Having in mind that some limitation of the scope of any immediate programme of farm electrification is probably desirable, one useful approach to the problem is to consider the progress in rural electrification already achieved or anticipated elsewhere, and to assume that comparable progress could be provided in Alberta. It would then be necessary to consider later whether this assumption was valid under the conditions in this Province.

Reference has been made earlier to the trend of farm electrification in other provinces and in the Western States; and the main features of the programme recommended by the Manitoba Electrification Enquiry Commission have been outlined. The progress in other parts, when a deliberate effort at extension of farm electrification has been made, suggests that, if conditions in Alberta were substantially similar, electrification of 30% of the farms in the Province, over a period of ten years, would be an accomplishment fully commensurate with achievements elsewhere. As the Census of 1941 recorded approximately 100,000 farms in Alberta, this would call for the electrification of 30,000 farms at an average rate of 3,000 farms per year.

THE TENTATIVE POTENTIAL SERVICE AREA.--If the electrification of 30,000 farms over ten years is accepted as the tentative scope of a programme of rural electrification in Alberta, the next step is to define a potential service area within which at least this number of users might be found.

It has been stressed that the largest number of additional users can be served from a given expenditure of public funds when extensions are made in those localities where costs per user are lowest; and that costs are likely to be lowest in those localities close to existing sources of supply, and/or where there is the greatest density of potential users.

In Alberta the existing transmission systems serve the areas with the greater density of farms and rural population: Within the boundaries of an area which includes all of the existing transmission lines, there are to be found more than two-thirds of the farms in the Province, and more than two-thirds of the rural population. This area is defined as the potential service area. Its boundaries are shown in Figure 2.

The portions of the province not included in this tentative potential service area are, first, the sparsely settled area of south-eastern Alberta, within which the density of farms is generally so low as to involve excessive costs of distribution of central station power; and second, the sparsely settled districts in fringe areas. In the fringe areas farms are small and in many cases only partially developed; and the direction and progress of future settlement is uncertain. Plans for the electrification of farms in these districts might have to be substantially modified in a few years; or, if included in a scheme and distribution lines erected, changing conditions might later result in duplication and uneconomical distribution.

The significant features of this tentative potential service area are summarized below (Table 17).

Table 17.--Principal Features of the Potential Service Area

Total Rural Population--1936	No.	323,504
Total Rural Population--1941	No.	318,557
Decrease in Rural Population--1936-41	No.	4,947
Farm Population--1936	No.	289,170
Non-Farm Rural Population--1936	No.	34,334
Proportion of Non-Farm Rural Population --1936	%	10.6
Total Area[1]	Ac.	26,563,181
	Sq. Miles	41,505
Density of Rural Population--1936	Persons per Sq. Mile	7.8
Density of Rural Population--1941	Persons per Sq. Mile	7.7
Number of Farms--1936	No.	69,617
Number of Farms--1941	No.	68,816
Decrease in Number of Farms--1936-41	No.	801
Total Area, per farm[2]--1941	Ac.	386
	Sq. Miles	0.6
Average Size of Farm, Total Acres--1936	Ac.	347
Average Value of Farm Property--1936	$	7,784
Average Value of Buildings--1936	$	1,363
Proportion of Tenant Farmers--1936	%	10.5
Proportion of Rural Population of British Races--1936	%	44.7

[1] Total Area is the area of the potential service area in acres and square miles.

[2] Total Area, per Farm is the Total Area, as in (1), divided by the number of farms.

The total rural population in the potential service area represents 65.1% of the rural population of Alberta, 1941; and the area includes 68.6% of all farms in the Province, 1941. If the proportions of farm and non-farm population in 1941 were the same as the proportions in 1936, the service area would include 284,790 persons living on farms, 1941, and 33,767 non-farm rural persons, 1941.

Between 1936 and 1941, the number of rural persons and the number of farms in the service area both declined. Total rural population in the Province increased over the same period from 486,335 to 489,583. Total number of farms recorded by the Census was 100,358 in 1936 and 100,333 in 1941; but, with differences in

the method of enumeration, this apparent decline is not significant. It appears therefore that, on the whole, rural population and numbers of farms in the service area were contracting slightly, while other rural parts of the Province, particularly in the north fringe areas, were expanding.

In the service area the density of rural population, although greater than in the settled parts of the Province generally, is light at 7.6 persons per square mile. Similarly, acres per farm (386 acres) and average size of farm (347 acres), although smaller than for the settled parts of the Province generally, reflect in comparison with all other provinces than Saskatchewan, relatively unfavourable conditions for distribution of central electric station power to farms.

In regard to farm electrification conditions throughout the area are far from uniform. Not all localities provide conditions equally favourable to the distribution of electric power. Some localities are too far from existing transmission lines to be served by low-cost, low-voltage farm lines. The servicing of these localities would involve additional costs in the use of more heavy conductor, the extension of existing high voltage transmission lines, or possibly the development of alternative sources of power. In some localities the density of farms is relatively light. In other districts, close to transmission lines and with moderate or even heavy density, there might be reasonable doubt as to the willingness and ability of the farm people to install appliances and purchase power. In all districts within the defined service area there are farms which are submarginal either in respect to size or to the character of the land, and which in time are likely to disappear as independent units. Similarly, in all districts there

are likely to be some farmers who will be unwilling, at least for a time, to install the necessary appliances and to purchase power on the terms on which these are made available. For the above several reasons it cannot be expected that all the farms within this territory could be served with power.

For the purposes of this enquiry the tentative potential service area was divided into 16 districts within each of which conditions affecting farm electrification appeared to be relatively uniform; but between which significant differences are apparent. A detailed description of the characteristic features of each of these districts is presented in Appendix I. The following information merely serves to indicate the substantial differences between districts in some of the conditions affecting farm electrification (Table 18).

Table 18.--Variations between Districts in Certain Features Affecting Farm Electrification

		Range among Districts	
		Lowest	Highest
Density of Rural Population--1941	Persons per Sq. Mile	3.2	14.2
Proportion of non-farm Rural Population--1936	%	6	30
Area in District, per Farm--1941	Ac.	230	912
Average Size of Farm, Total Acres --1936	Ac.	223	898
Average Value of Farm Property --1936	$	3,831	15,273
Average Value of Farm Buildings --1936	$	745	2,385
Proportion of Tenant Farmers--1936	%	8	30
Proportion of Rural Population of British Races--1936	%	8	72

It is difficult to rate districts, in regard to farm electrification, on the basis of information of this type. In all districts some features may be favourable and others unfavourable. For example, in some districts density of population and of farms may

be favourable, but with small farms and low farm values, income may be an important limiting factor. In other districts where farm values are high and farms large, income per farm may be favourable, but low density of farms would make for high costs per farm. Two districts, namely, District III, Cardston-Drumheller, and District XIV, Smoky Lake-Mundare, may be used to illustrate the point that in all districts some features are favourable while others are unfavourable (Table 19).

Table 19.--Comparison of Certain Features Affecting Farm Electrification, in two Districts

		: District III	: District XIV
Density of Rural Population --1941	Persons per Sq. Mile	5.1	14.2
Proportion of non-farm Rural Population--1936	%	16	9
Area in District, per Farm --1941	Ac.	592	255
Average Size of Farm, Total Acres--1936	Ac.	541	223
Average Value of Farm Property --1936	$	12,220	5,274
Average Value of Farm Buildings--1936	$	1,917	1,007
Proportion of Tenant Farmers --1936	%	30	8
Proportion of Rural Population of British Races--1936	%	57	8

GENERATING CAPACITY AND POWER REQUIREMENTS FOR FARM ELECTRIFICATION.--Having reached tentative decisions with regard to the scope of the survey and the potential service area, it was then necessary to consider whether the existing sources of power might prove adequate, in the post-war years, to provide the power required for a programme of rural electrification of the scope contemplated.

Whether the power available in the post-war years will be sufficient for an extensive programme of farm electrification projected over a number of years depends upon a number of conditions

some of which are difficult to predict. These conditions include (a) the probable consumption per farm and the rate at which it may be increased over a period of years; (b) the rate at which farms are connected; (c) present generating capacity and present load on the transmission systems; (d) the decrease in demand for power which may follow the cessation of hostilities and accompany the shift-over to peace-time activities; (e) the rate at which demand for power for peace-time industrial activities in the Province may increase over the period of extension of farm electrification.

Probable Consumption per Farm.--The probable consumption per farm is difficult to estimate. The evidence from other provinces and from the United States shows marked differences in average consumption per farm, associated with differences in farm requirements, attitudes to the use of electric power, farm incomes, rates, and the length of time the farms have been connected. In Quebec (Shawinigan Power Company customers) despite low rates the average consumption per farm in 1940 was only 360 kwhr. Ontario farm users averaged 1,600 kwhr in 1940. Farms served by the British Columbia Electric Railroad Company reached an average consumption of 700 kwhr in 1942. Data presented in the Report of the Manitoba Electrification Enquiry Commission show the average consumption for Power Commission farm customers to be 398 kwhr per annum; for Winnipeg Electric Company farm customers as 803 kwhr; and Winnipeg-Hydro farm customers as 1,274 kwhr. The average farm consumption for all utilities was 659 kwhr. In Alberta, the average consumption for farms served by the Calgary Power Company was 1,357 kwhr in 1942. Farm customers of the Canadian Utilities Limited averaged 700 kwhr. Average consumption over all systems financed by the R. E. A. ranged from about 600 kwhr for

systems energized up to 12 months to about 1,000 kwhr for systems over 48 months old.

The evidence is some cases, for example, Winnipeg Electric, Winnipeg Hydro, and Calgary Power, must be discounted because of the small number of select users involved. On the other hand the actual results will depend on the programme of education and promotion and its effectiveness in building up consumption; on the costs of wiring buildings and of purchasing appliances; on the consumption rates charged; and, perhaps most important of all, on the incomes of farm producers. The possibilities of building up consumption are difficult to estimate on the basis of available evidence. Reference has already been made to the experience of the R. E. A. systems. In Ontario average consumption per farm customer increased between 1928 and 1941 from 1,200 to 1,600 kwhr or 25% in thirteen years. The Manitoba report shows that farms connected one year had a median consumption of 243 kwhr; the median for those connected five years was 849 kwhr. All evidence of this kind is complicated by the fact that early extensions are frequently, if not generally, made in districts where conditions are favourable to large consumption per farm.

Assuming extensions made at a uniform rate, average consumption for farms connected one year of 300 kwhr, and an annual increase of 100 kwhr per farm per year, the average consumption of farms connected ten years would be 1,200 kwhr, and the average over the whole system, 750 kwhr. It is probable that these levels of consumption could only be secured through considerable effort in education and promotion, and with favourable conditions of farm incomes. Under these assumptions and with 30,000 farms connected in ten years, total annual consumption would reach 22,500,000 kwhr.

If it is difficult to estimate the consumption per farm it is equally difficult to estimate the generating capacity required to meet a given average consumption. Two additional problems are introduced, namely, line losses and the diversification of load. In Ontario, with annual consumption of 1,600 kwhr it is estimated that farm electrification requires an average of about 2/3 horsepower per customer. In Quebec (Shawinigan), with average consumption of 360 kwhr the average requirements are said to be no more than 1/3 horsepower. On the other hand, the Manitoba report states "It is estimated that the average peak demand per farm would be 600 watts, and that the peak demand for 25,000 farms would not exceed 30,000 horsepower at the power plants." It can perhaps be safely assumed that the initial requirements per farm connected in Alberta would be considerably less than one horsepower per farm, and might, at the end of ten years, approximate one horsepower. Additional power would be required for non-farm rural users.

Present Generating Capacity and Load.--Information secured on the present capacity and load, for plants and systems which would be affected by farm electrification, suggests present excess capacity which would provide for a substantial measure of farm electrification. The difference between generating capacity and peak load on the system of Calgary Power Company is reported to be about 18,000 kilowatts. The present capacity of the municipal plant at Edmonton is 34,000 kilowatts and present peak load 26,400 kilowatts; and a new unit of 15,000 kilowatt capacity is being installed and will be in operation shortly (January, 1944). Not all this excess capacity could be considered as available for other uses; but if it could be assumed that one-half might be available

for farm electrification, this would be sufficient for any extensions which might be made for a number of years.

Post-War Demand for Power.--Utilities generally anticipate a sharp drop in load at the end of the war. Increased load during recent years has been largely the result of activities associated with war production and services. This part of the present demand, it may be assumed, will disappear when the war ends. In many situations war-plants will be shifted over to peace-time uses, or may continue to operate, probably at reduced intensity, for peace-time purposes. In other situations no peace-time use can perhaps be expected.

For example, the Alberta Nitrogen plant, constructed during the war, is a very large user of power purchased from the Calgary Power Company. Company officials anticipate that this plant will continue to operate, but that, under conditions appropriate to peace-time, the normal consumption of power might drop to one-half its present level. The utilities also serve airports, army camps, and prisoner-of-war camps. It seems reasonable to expect that in the case of some airports the present demand will be well sustained; but that others, if used at all, will serve only as emergency landing fields. Consequently some substantial decline in demand in this connection is likely to occur; and army camps and prisoner-of-war camps may be totally disbanded. Over industry in general, some shifting of production, reduction of hours, and generally reduced intensity, is likely to result in reduced industrial load.

Information received indicates that Calgary Power Company anticipate an ultimate load drop with cessation of hostilities of some 16-17,000 kilowatts. Canadian Utilities Limited anticipate

excess capacity of 400 kilowatts at Grande Prairie, and 2,500 kilowatts at Drumheller. Stoppage of war industries in Edmonton would probably reduce the peak load by 3,000 kilowatts, according to information received from the city power plant.

Assuming that the full anticipated reduction in load, supplemented by existing excess capacity, were available for farm electrification there would appear to be, in prospect, ample power for an extensive post-war programme of farm electrification. At one horsepower per farm, a capacity which might be required at the end of ten years of extension of farm distribution lines, and with 30,000 farms connected at the end of this period, the total farm capacity would amount to about 20,000 kilowatts.

However, it is reasonable to suppose that other uses for power will emerge in the post-war years. If the anticipated drop in load occurs utilities generally are likely to be concerned with discovering and developing alternative outlets, and to engage in load-building activities. Efforts directed toward securing a larger measure of industrialization are likely to feature any post-war reconstruction programme in the Province. If the efforts of utilities and of government in this direction are effective, industrial and commercial consumption of power may expand sufficiently rapidly to limit the power available for farm electrification.

Viewed from the standpoint of farm electrification alone, no increase in present generating capacity would appear to be necessary; but this statement must be qualified to take account of other possible developments which would result in increased consumption of power. If an extensive farm electrification programme were undertaken, and at the same time industrial power requirements expanded, it might be necessary, before the completion

of the farm programme, to add to existing capacity. This cannot be foreseen at the moment but should it prove to be the case, ample potential power resources exist to provide for any necessary expansion of generating capacity.

USE OF ELECTRICITY IN FARM OPERATION, AND IN THE FARM HOME.-- It has been said that the uses of electricity on the farm are limited only by the ingenuity of the farmer; and this statement is probably true. It is possible to enumerate an imposing list of uses which have already been found for electricity on the farm.[1/] But the existence of many uses to which electrical power can be applied does not prove either that it is to the advantage of the individual farmer to use electricity for these purposes, or that he is in a position to do so even if it appeared to his advantage. Despite the advances in electrical technology railroad locomotives still burn coal, transport buses operate on gasoline, and in many urban Alberta homes cooking and heating are performed with the aid of natural gas. The problem is essentially one of alternative means of performing the same task, and the best solution of the problem may well differ in different cases.

On the farm electric power cannot, as yet, supplant other sources of power for traction purposes. This implies that farms must retain enough other power for draught purposes. Under conditions where the tractor is the most suitable source of power for field operations, the farmer has in the tractor a source of power for heavy belt operations. Whether it is worth his while to install an electric motor sufficiently large to be used for grain grinding or threshing depends on the investment in the new equip-

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1/ See, for example, the Report of the Manitoba Electrification Enquiry Commission, Chapter IX, The Advantage of Electric Power on the Farm.

ment (and the alternative uses to which it could be put), the relative operating expenses, and any other advantages and disadvantages, some of which it is difficult to value in dollars and cents, of the alternative sources of power.

In the case of other uses to which electrical power might be put on the farm, there is an alternative source of power already in use or available. Indeed there is probably no stationary use to which electricity could be put for which there is no available alternative source of power. Consequently the choice is not between electricity or being unable to perform useful operations. The choice is rather between one way of doing the work and another. For example, if the farmer already has a windmill or stationary gasoline engine for pumping water the desirability of installing an electric motor for this purpose would depend on the difference between the salvage value of the windmill or engine and the cost of an electric motor (and the alternative uses to which this net investment could be put), the relative operating expenses, and any other advantages or disadvantages of either source of power.

Reliable information on the comparative expenses of performing farm operations by electricity or alternative sources of power is difficult to obtain. It appears that in many cases, at power rates which might be expected, if the initial capital could be found and if cash income is sufficient to meet the monthly bill, farm operations can be performed at less expense by electricity than in other ways. In addition electricity can make an important contribution in reducing the irksomeness of labour and in reducing the time spent by the farmer on particular operations. However desirable this is, it is obvious that the prospect of a reduction in labour effort on the part of the farmer does not provide the

capital to install electrical equipment; neither does its realization pay the monthly bill.

If electricity, on its merits, is to prove an effective competitor of other sources of power already on farms it must be possible for the farmer to finance the purchase of electrical equipment, and farm incomes must be sufficient to meet the periodic payments for the service provided. Even where these requirements were met, the change to electrical power might not appear worthwhile to the individual farmer. In some cases this might well reflect wise judgement; in others the decision could be a mistake due to lack of knowledge of the comparative advantages of electrical power. If farmers are to make wise decisions with regard to the use of electrical power for farm operations, an extensive educational programme would appear to be necessary, with information provided to the individual farmer on the basis of a careful study of his particular situation and power requirements.

Electric power has also extensive uses in the farm home. The lack of facilities and conveniences which are made possible by electricity is perhaps the outstanding feature distinguishing rural from urban homes; and it is not surprising that when farms are connected the main uses to which power is immediately put are domestic uses.

Some data descriptive of rural homes and of the facilities and conveniences in them follow. These data are drawn from three sources: first, Housing Census of Canada, 1941, preliminary release No. 31, Canadian Farm Homes and Households, Dominion Bureau of Statistics. Second, unpublished material from studies of farm living being made by the Economics Division, Dominion Department of Agriculture in cooperation with the Department of Political

Economy, University of Alberta. Field surveys have been completed in the St. Paul-Bonnyville district, and in the Red Deer-Lacombe-Wetaskiwin district. Third, the field surveys conducted in connection with this enquiry.

The Dominion Housing Census, 1941, recorded an average value for Alberta farm dwellings of $989; and it was reported that 44.9% of the farm houses were in need of external repair. Over the Province as a whole 90.5% of farm dwellings are of wood exterior. The average number of rooms per dwelling is 4.1; and rooms per person 1.0. Over 87% of farm homes are heated with stoves, and 10.6% with hot air furnaces. Fifty-seven per cent. use wood for heating and 42.0% use coal. Wood again provides the main fuel for cooking (71.7%); coal is used for this purpose in 27.0% of farm homes; and electricity in 1.2%. The proportions of farm homes in Alberta having various conveniences are shown below (Table 20).

Table 20.--Proportion of Farm Homes in Alberta Having Various Conveniences, 1941[1]

Electric Lighting	5.5%
Electric Vacuum Cleaner	1.2%
Bathing Facilities	4.3%
Flush Toilet	2.5%
Refrigeration	17.7%
Telephone	18.1%
Radio	72.9%

[1]Source: Housing Census of Canada, 1941. Preliminary Release No. 31.

The Bonnyville and Red Deer studies provide a comparison of homes in a relatively new area and in a well-established farming community.

Comparative data follow (Table 21).

Table 21--Comparison of Farm Homes in Two Districts in Alberta[1]

	Bonnyville Proportion of All Farms	Red-Deer-Wetaskiwin Proportion of All Farms
	%	%
House Construction:		
Brick, Stone or Painted Frame	20.8	64.5
Frame Unpainted	52.8	33.0
Log	26.4	2.5
One Room or More per Person	32.1	75.9
Heating:		
Furnace	5.7	29.6
Heater	77.3	67.0
Stove only	17.0	3.4
Basement:		
Improved or Full	22.6	57.1
Part Dirt	69.8	38.4
No Basement	7.5	4.4
Lighting:		
Electricity	3.8	15.3
Mantle Lamps	49.1	62.1
Coal Oil only	47.2	22.7
Household Conveniences:		
Sewing Machine	86.8	92.1
Telephone	1.9	49.8
Radio	77.4	93.1
Power Washer	34.0	61.6
Sink	26.4	38.9
Cistern	3.8	12.8
Running Water	----	11.3
Sewage Disposal (Septic Tank or equal)	----	10.3
Bathroom	----	14.3

[1]Data prepared by Miss F. M. Edwards, Economics Division, Dominion Department of Agriculture.

Further evidence of the condition of Alberta farm homes and of the differences in different parts of the Province is provided by information obtained in field surveys in connection with the present enquiry (Table 22).

Table 22.--Comparison of Farm Homes in Sample Areas Surveyed.

	Type of House[1]			Condition of House[1]			Rooms	
	Frame	Stucco	Log	Good	Fair	Poor	per House	per Person
	%	%	%	%	%	%	%	%
Brooks	100	-	-	26	28	46	4.7	1.2
Claresholm	96	4	-	50	22	28	6.1	1.7
Langdon	94	6	-	42	18	40	6.7	2.2
Olds	95	4	1	44	25	31	5.6	1.4
Castor	93	7	-	29	45	26	5.1	1.0
Clive	88	1	11	56	26	14	5.3	1.4
Rimbey	79	9	8	36	43	21	4.8	1.3
Killam-Strome	91	-	6	57	36	7	6.8	1.8
Camrose	96	-	-	37	49	12	5.4	1.3
Clandonald	94	-	6	22	47	25	3.9	1.1
Ellerslie	88	6	2	61	29	10	5.7	1.4
St. Paul	17	-	83[2]	19	51	26	3.6	0.7
Pickardville	56	4	40	40	36	22	4.1	1.1

[1]Where percentages do not total 100% the remaining houses were unspecified.

[2]This proportion of log houses, based on the sample area, is undoubtedly higher than would prevail over a larger area.

There is ample evidence to support the earlier statement that when farms are first connected the appliances installed are mainly for domestic use. Among these domestic appliances it would appear that the cost of the appliance influences the choice. All farms connected have lighting. In both Ontario and Manitoba only four appliances are found on more than 50% of the farms connected. These are, in the order of the frequency of their occurrence, the hand iron, radio, washer and toaster. Again in both provinces, appliances found on more than 10% (and up to 30%) of the farms connected include the hot plate, range, vacuum cleaner, pump in the house and refrigerator. The only outside appliance occurring on more than 10% of farms in either province is the pump. Among other outside appliances the more common are the cream separator, and milking machine; other appliances are installed in less than 5% of the farms. Evidence in Alberta is confined to farms with

individual plants which are limited in the service they can provide. The most common appliances appear to be the washer, radio and vacuum cleaner.

Although in part the type of appliances installed reflects the relative cost of equipment, the evidence clearly suggests that farm people want electricity primarily for domestic uses, to add to the conveniences of farm homes, and to lighten the labour in the performance of household duties. Having in mind the existing lack of conveniences in farm homes, this is clearly a laudable objective. However, two points should not escape attention; first, these domestic uses do not directly or immediately increase the incomes of farmers or their ability to meet any increase in cash expenses associated with the purchase of equipment or the payment for service with electric energy; and second, it appears to be generally agreed that it is impossible to support rural electrification where power is used only for lighting and for a few household appliances. These considerations emphasize once more the dependence of any project of farm electrification on the incomes of farmers, and on a vigorous programme of load buildings.

SUMMARY.--(1) If conditions in Alberta were substantially similar to those elsewhere, electrification of 30% of the farms in the Province, over a period of ten years, would be an accomplishment fully commensurate with achievements elsewhere. Such a programme would involve the electrification of 30,000 farms at an average rate of 3,000 per year.

(2) An area including all existing transmission lines is referred to as the potential service area. This area includes approximately two-thirds of the rural population, and about the

same proportion of all farms in the Province. In general, conditions within this area are somewhat less favourable to farm electrification than are conditions in other provinces. There are marked differences between districts within the potential service area.

(3) Consumption per farm is difficult to predict. If average consumption for farms connected for one year was 300 kwhr, and if the annual increase in consumption amounted to 100 kwhr, the average consumption over the entire system would be 750 kwhr per year, at the end of ten years. With 30,000 farms connected, total annual consumption would amount to 22,500,000 kwhr.

(4) It is likewise difficult to estimate the generating capacity required to meet a given average consumption per farm. It can perhaps be safely assumed that the initial requirements per farm connected in Alberta would be considerably less than one horsepower per farm, and might, at the end of ten years, approximate one horsepower. Additional power would be required for non-farm rural users.

(5) Taking into account some existing excess capacity and the anticipated drop in load after the war, no increase in present generating capacity would be necessary to provide for an extensive farm electrification programme alone. If an extensive farm electrification programme were undertaken, and at the same time industrial power requirements expanded, it might prove necessary, before the completion of the farm programme, to add to existing capacity. This cannot be foreseen at the moment, but should it prove to be the case ample potential power resources exist to provide for any necessary expansion of generating capacity.

(6) Electricity has many uses in farm operations. If farmers are to make wise decisions with regard to the use of electrical power for farm operations, an extensive educational programme would appear to be necessary, with information provided to the farmer on the basis of a careful study of his particular situation and power requirements.

(7) The evidence clearly suggests that farm people want electricity primarily for domestic uses. Having in mind the existing lack of conveniences in farm homes, that is a laudable objective. However domestic uses do not immediately increase farm incomes, nor is it possible to support rural electrification where power is used only for lighting and for a few household appliances. These considerations again emphasize the importance of farm incomes, and of a vigorous programme of load building.

CHAPTER IV

COST OF CONSTRUCTION OF FARM DISTRIBUTION LINES

This chapter describes the method followed in estimating construction costs, and the type of distribution lines on which the estimated costs are based. Estimated construction costs for 18 sample areas in the Province are summarized.

ESTIMATES OF FARM CONNECTIONS PER MILE OF ROAD LINE AND SERVICE TAP OFF.--The cost of farm line construction per farm connected depends upon the cost per mile of line and the number of users per mile. To estimate construction costs per farm it was necessary to specify a particular type of farm line, and to arrive at some estimate of the probable number of connections per mile.

To provide essential information, field surveys were undertaken in various sections of the tentative potential service area; the location of the surveys being selected with a view to sampling

each of the 16 districts referred to in Chapter III, and shown in Figure 2. At the time this enquiry was commenced Calgary Power Company and Canadian Utilities Limited had already completed surveys in certain localities adjacent to their transmission lines; and the companies were prepared to proceed with further surveys. The programme of field surveys of the Research Council of Alberta was, therefore, devised to ensure at least one sample survey in each district, with the exception of District I. Where it was thought that the localities covered in the companies' surveys were not representative of the districts in which the surveyed areas were located, additional and supplementary surveys were made. In carrying through its part of the programme of field surveys, the Research Council received valuable assistance from the Economics Division, Dominion Department of Agriculture.

Eighteen surveys were made. The location of the areas surveyed, and the agency securing the information, are shown below (Table 23). The total area included in the 18 surveys was approximately 764 square miles; and the total number of farms was 1,451.

Table 23.--Location of Surveys, Agencies Making Surveys, Areas Surveyed, and Number of Farms

District	Location of Survey	Agency Making the Survey	Approximate Area Surveyed square miles	No. of Farms in Area[1]
I[2]	---	---	---	---
II	Brooks	Calgary Power Co.	72	158
III	Claresholm	Calgary Power Co.	72	113
IV	Langdon	Calgary Power Co.	36	68
V	Olds	Calgary Power Co.	80	156
	Three Hills	Canadian Utilities Ltd.	36	42
VI	Castor	Dominion Economics Division	36	44
VII	Clive	Dominion Economics Division	36	93
	Stettler	Canadian Utilities Ltd.	36	49
VIII	Rimbey	Dominion Economics Division	36	74
IX	Killam-Strome	Research Council	36	52
X	Camrose	Research Council	36	80
XI	Vermilion	Canadian Utilities Ltd	18	27
	Clandonald	Dominion Economics Division	36	62
XII	Ellerslie	Research Council	36	130
XIII	St. Paul	Dominion Economics Division	36	70
XIV	Mundare-Vegreville	Canadian Utilities Ltd	36	66
XV	Pickardville	Research Council	36	83
XVI	Grande Prairie	Canadian Utilities Ltd.	54	84

[1]Where the area surveyed was a township, farms across the road allowance and within one-half mile of the road were included for purposes of drawing farm distribution lines.

[2]No survey was made in District I.

The field surveys had three main purposes, namely; first, to determine the location of farmsteads and the distance of these from road allowances or boundary fences; second, to rate the farms as prospective users of power; and third, to secure supplementary information describing the type of buildings, type of farming, power equipment on farms, and probable power requirements. In addition it was hoped that the localities selected for survey would be sufficiently representative of the districts in which they occurred to justify generalizing from the evidence they provided.

The location of farmsteads was recorded on a township plan on which were marked the distance along the road allowance and the distance from the road allowance to the buildings. This information made it possible to measure the length of line and tap off required to connect individual farms.

A rating of 'good', 'fair' or 'poor' was placed on each farm. 'Good' farms were those which could be expected to take power if distribution lines were constructed in the district. In the case of 'fair' farms, there appeared to be some possibility that these farms would become power users. 'Poor' farms were considered to be unlikely prospects.

On the basis of this information farm distribution lines were drawn on the township plan. In drawing the lines the following general rules were followed. First, lines were drawn to connect all farms rated as 'good', unless it proved necessary to extend the line (including tap-off) more than one and one-half miles to connect a single farm. Second, one-half of the farms rated as 'fair' were connected preference being given to those close to the lines already drawn to connect 'good' farms. Third, 'poor' farms were not connected.

The following table (Table 24) shows for each area surveyed the proportion of farms rated 'good', 'fair', and 'poor'; the probable connections; the total miles of line and tap-off; and the estimated connections per mile.

Table 24.--Rating of Farms, Probable Connections, and Connections per Mile of Line and Tap

Area Surveyed	Proportion of Farms Rated			Probable Connections		Miles of Line and Tap-Off	Connections per Mile
	'Good'	'Fair'	'Poor'	Number	Per Cent		
	%	%	%	No.	%	Mi.	No.
Brooks	28	27	45	65	41	29.3	2.21
Claresholm	49	20	31	67	59	52.9	1.26
Langdon	32	15	53	26	38	23.3	1.11
Olds	39	22	39	75	48	53.9	1.39
Three Hills	64	22	14	32	76	22.8	1.40
Castor	41	19	40	21	47	23.4	0.90
Clive	74	19	7	65	70	42.1	1.54
Stettler	33	24	43	21	42	20.7	1.01
Rimbey	64	23	13	51	69	31.0	1.64
Killam-Strome	56	33	11	32	62	28.3	1.13
Camrose	37	45	18	34	42	28.0	1.21
Vermilion	48	12	40	13	48	11.1	1.17
Clandonald	50	35	15	41	66	35.9	1.14
Ellerslie	73	17	10	103	79	54.6	1.89
St. Paul	31	46	23	40	57	31.3	1.27
Mundare	33	6	61	23	34	18.0	1.27
Pickardville	28	35	37	36	43	34.4	1.05
Grande Priarie	53	19	28	50	59	47.4	1.05
All Areas	--	--	--	795	54	588.4	1.35

The reliability of the estimate of miles per connection in each area depends largely on the rating given to the farms. If the ratings do not accurately reflect the extent to which farms in the locality might be prepared to connect with a farm distribution system, the estimates of cost per farm shown later may be higher or lower than they would actually prove to be if extension of distribution lines were undertaken.

It is clear that the rating of farms in the manner described above involves a substantial element of judgment. In arriving at the rating for individual farms the field enumerator was assisted by an interview with the farmer (in most cases), by some inspection of the farmstead, by the recording of information regarding type of building, mechanical equipment available, and probable power requirements. As the field enumerators were men of experience and knowledge of farming conditions it may be assumed that the ratings placed on farms were based on as reasonable and reliable judgment as could be secured. It must however be admitted that if at some later time and under specific conditions, power service were offered to farmers in these localities the response might be quite different from that suggested by the ratings. Conclusive evidence of willingness to purchase power can be secured only when farmers are confronted with a concrete proposal for the provision of service, and commit themselves by contracting to purchase power on the terms stipulated.

In rating the farms no weight was given to two factors which might present practical difficulties. No consideration was given to problems presented by landlord-tenant relations in connection with the wiring of farm buildings on rented farms. Similarly, no consideration was given to the fact that some farmers had installed

individual electric plants, and that this might present a problem in connecting these farms to a distribution system. The special problems presented by the rented farm and the farm with a plant already installed are considered later in this Report.

The estimates of connections per mile from the sample surveys present another problem. If the sample area is not representative of the district in which it is located some error is involved in generalizing from the sample to the district as a whole. In the selection of most of the areas which were surveyed some preliminary consideration was given to the choice of areas which might prove to be reasonably typical of the districts in which they are located. Special attention was given to the apparent density of farms, with the object of selecting areas with about the average density of farms for the district. A comparison of some of the data collected in the surveys with available census, and other official statistics for the districts, provided a rough test of the representativeness of the sample. The application of this test disclosed that, in some cases, the sample farms were apparently substantially representative of farms in the district. In other cases some significant divergence between the sample and the district data was apparent. In these latter cases the samples cannot be considered wholly representative of the district, and generalizations based on the evidence of the sample may tend to over-or under-estimate the costs of electrifying farms in the district as a whole. This problem is referred to in Appendix I. In the discussion of the detailed statistics for each district the probable direction of the sampling error is suggested. Although it is necessary to call attention to this problem here, it appeared preferable in the application of the estimates to accept the evidence of the surveys

rather than to attempt any modification of the estimates.

ESTIMATES OF CONSTRUCTION COSTS PER FARM CONNECTED.--The estimates of construction costs are based upon a particular type of farm distribution line. This is both necessary and desirable. Estimates must be based on some type of construction, and therefore some decision regarding the most appropriate type of line is unavoidable. But in addition, it is desirable, as a means of reducing costs, to effect as large a measure of standardization of materials and structures as possible, while maintaining enough flexibility to permit of modifications to meet the particular requirements of specific localities.

The type of line on which cost estimates have been based, and which is recommended as the standard for farm line construction, can be described briefly. Details are given in Appendix II.

Electrical installations of any description vary with the type and size of load to be served. Since this study indicates that in most locations less than 1.5 customers per mile of line will be served and that each customer will only use about 600 kwhr per year, it is absolutely essential that the line cost be kept low. This necessitates limiting the size of motor used, and requires that the design be based on a greater line voltage drop than would be considered for urban service. The type of construction proposed is similar to that used by the R. E. A. in the United States, and by the Hydro Electric Power Commission of Ontario for rural lines.

For this study, estimates have been based on the use of 6,900 volt, single phase lines with one wire solidly grounded at all transformer installations and at certain intermediate locations. The neutral secondary wire would be solidly interconnected with the primary grounded wire.

Power would be taken from existing high voltage transmission lines and stepped down to 6,900 volts. For this purpose a 50 K.V.A. transformer would be used which it is expected would serve about 100 customers. The 6,900 volt lines would run along the roads or inside fences to the various farms and a 1.5 K.V.A. transformer would be installed at each farm. This would deliver electricity at 115-230 volts to the consumer. It is necessary that these lines follow the roads in order that they may be easily patrolled.

Transformers would be protected by fuses and lightning arresters. Long spans are proposed, using only about 17 poles per mile. To maintain adequate clearances without use of high poles it is necessary to use a high strength conductor which can be strung with small sag. Since the current to be carried is small, a steel wire is proposed, though it may be necessary to use some better conductor for the first part of the line from the sub-station. With these conductors it will be possible to use 30 foot poles except at crossings and for grading.

The proposed type of construction should serve an area extending about twelve miles on each side of the transmission line. This would require a 50 K.V.A. transformer installation at approximately four mile intervals along the transmission line, varying, of course, with the distribution of farms. Maximum voltage drop would be about 10%, and motor sizes would be limited to three horsepower.

Drawings are attached to this Report which show the construction in detail (Appendix II). The feature of the line is the emphasis on low cost consistent with safe and reliable service. Some limitations on the service possible are referred to later in this chapter; but it is suggested that these are not such as to cause serious inconvenience. More elaborate service would increase costs.

The method of estimating the cost per farm connected was as follows. The procedure of drawing distribution lines on the township plans has already been described. The number of different structures required was obtained by inspection and count; and the estimate of total construction cost for each sample area was built up from unit structure costs. The cost per connection was derived from the total construction cost and the number of farms connected.

Estimates of construction costs per connection for each of the areas surveyed are given in the following table (Table 25.)

Table 25.--Miles of Line and Tap per Connection and Estimated Cost per Connection

District	Area Surveyed	Probable Connections	Miles of Line and Tap per Connection	Estimated Cost per Connection
			Mi.	$
II	Brooks	65	0.45	455.68
III	Claresholm	67	0.79	605.86
IV	Langdon	26	0.90	700.15
V	Olds	75	0.72	576.21
	Three Hills	32	0.71	559.45
VI	Castor	21	1.10	759.46
VII	Clive	65	0.65	544.69
	Stettler	21	0.98	672.35
VIII	Rimbey	51	0.61	512.61
IX	Killam-Strome	32	0.89	653.20
X	Camrose	34	0.83	616.42
XI	Vermilion	13	0.85	632.84
	Clandonald	41	0.87	623.62
XII	Ellerslie	103	0.53	464.03
XIII	St. Paul	40	0.78	590.14
XIV	Mundare	23	0.78	589.48
XV	Pickardville	36	0.95	655.15
XVI	Grande Prairie	50	0.94	649.31
	All Areas	795	0.74	575.87

The following points are important in interpreting these cost estimates.

(1) The estimates should be interpreted in the light of the earlier comments on the rating of farms and on the representativeness of the sample areas.

(2) The type of line proposed would it is estimated carry power out a distance of twelve miles on either side of the transmission line and would be capable of serving approximately 100 farms from the one substation. However, to ensure service over this distance and to this number of farms it would be

necessary to include some heavy conductor. As this was not necessary for the, generally, smaller number of farms in the samples, the additional cost of heavy conductor would have to be added to the estimates; and might increase the general average to $600 per farm.

(3) The cost estimates are based on 1943 prices for materials laid down at Calgary, less the customary trade discount. In the selection of materials consideration was given to relative prices in 1943, and the object throughout was to specify the type of structure and materials which would keep costs at a minimum consistent with safe and reliable service. The cost at which the specified type of line can be constructed in the post-war years will depend on the movement of prices. Relative prices at that time may require some changes in construction. Any arrangements, e.g. through standardization, which would reduce the prices of materials would have a significant effect on costs.

(4) Certain elements of cost associated with the laying of farm distribution lines are not included in the estimates. In the first place, before lines could be built in any district, time, effort, and expense would be involved in organizing, securing contracts, and surveying the territory. These costs are not included in the estimates. Secondly, the estimates assume free easement for lines constructed on the property of private persons, and omit any costs associated with the registration of easements. If lines are constructed on road allowances the estimates do not include any cost which might at some time be incurred if it were necessary to move the lines.

(5) The estimates are based on an over-all saturation of 54%. This is low; although not necessarily inconsistent with the

realities of the problem. However, with the heavy overhead in line construction costs, costs per connection can be reduced appreciably where increased saturation is effected.

To indicate the effect of increased saturation, the farms located within one-half mile of the lines, as drawn to include 54% of all farms, were connected and the added costs computed. The servicing of these additional farms would raise the over-all saturation to 71%. The additional cost for each additional farm connected was estimated at $328.19; and the addition of these farms would reduce the over-all average cost per farm from $575.87 down to $518.81. It should be pointed out that nine out of ten of the additional farms were rated as 'poor' prospects for the purchase of power.

(6) The estimates of construction costs are based on taking power into the dwelling house. They include the cost of the transformer; the service structures required to carry power from the transformer on the road line to the house; and the meter. They do not include the cost of wiring inside the house, or wiring to or in any of the outbuildings.

Line construction includes both road line and service tap-off from the road line to the dwelling house. In ten areas surveyed the average length of tap-off was 470 feet; and the average per area ranged from 226 feet (Stettler) to 690 feet (Vermilion). The length of tap-off required for individual farms varied from a few feet to over 2,000 feet. Greater length of tap-off appreciably affects the cost of connecting individual farms. This is evident from the following estimates of tap and service costs for various distances from the road line (Table 26).

Table 26.--Length of Service Tap and Estimated Cost

Length of Service Tap from Line	Estimated Cost
	$
0 - 50 feet	183.42
50 - 200 "	206.19
200 - 350 "	241.51
350 - 650 "	265.54
650 - 950 "	289.57
950 - 1,250 "	313.60
1,250 - 1,550 "	337.63
1,550 - 1,850 "	361.66
1,850 - 2,150 "	385.69
2,150 - 2,450 "	409.72
2,450 - 2,750 "	433.75

(7) It is estimated that the type of line recommended, and used as the basis for cost estimates, would provide for the installation on each farm connected of motors up to three horsepower capacity. A three horsepower motor is sufficient to provide for all domestic requirements and to perform all the more common farm operations to which electrical power can be applied, with the exception of feed grinding with a large crusher. Where this type of line is built some limitation would have to be imposed on the size of motor to be installed. However, the limitations involved would not, it is thought, appear serious to most farmers. It is true that fairly substantial amounts of grain are crushed and used as feed on Alberta farms. Crushing can be done with a three horsepower motor as small crushers suitable to this size of motor are on the market. The process is a slow one, but with the addition of a self-feeding device, it is possible for the farmer to continue with other chores while the machine is operating. The problem could be met by arrangements which would permit the use of larger electric motors at specified times.

The problem presented here suggests a consideration which has more general significance to farm electrification. Equipment such

as the grain grinder is used for only a relatively small number of hours each year on most farms. The desirability of installing units of such equipment, or, in order to perform the operations, of installing an electric motor with capacity greatly in excess of what is normally required, would seem to be open to serious question. Alternative arrangements for cooperative ownership of heavy equipment, or for custom work, as well as the continued use of sources of power which the electric motor cannot wholly displace, should be considered before encouragement is given to duplication of heavy equipment and excess power capacity on individual farms.

The type of line selected presents some limitations to the service which might be provided. The 6,900 volt single phase line was chosen with a view to keeping construction costs down. Emphasis in low costs appears essential if any extensive programme of farm electrification is to prove workable. More elaborate service could be provided; but only at additional cost which would, it is felt, appear out of proportion to the advantages gained.

SUMMARY.--(1) Estimates are based on sample surveys in 18 areas, generally one township in size, distributed over 15 out of the 16 districts in the potential service area.

(2) The estimates of connections per mile of road line and tap-off range from 0.90 in the Castor area to 2.21 in the irrigated area at Brooks. The over-all average is 1.35 connections per mile.

(3) The estimates of connections per mile are appreciably influenced by the proportion of farms connected. The proportion ranges from 34% in the Mundare area to 79% in the Ellerslie area. The over-all average is 54%. These proportions are, in turn, influenced by the ratings placed on farms by the fieldmen. While

the ratings are probably as reasonable as could be secured, the element of judgement cannot be eleminated, and actual experience in securing contracts might result in a higher or lower proportion of farms connected.

(4) The representativeness of the sample area is important in applying the estimates to wider areas.

(5) Estimates of construction costs are based on a 6,900 volt, single phase line which is already in use in the R. E. A. systems in the United States, and in Ontario, and is proposed in the Report of the Manitoba Electrification Enquiry Commission.

(6) Estimates of costs per connection range from $456 in the irrigated area at Brooks to $759 at Castor. The over-all average is $576 per farm with 0.74 miles of road line and tap-off per connection. These costs are based on taking the power into the dwelling house. They include the cost of transformer, meter, and other service structures; but not wiring in the house or between buildings.

(7) In one respect the estimates are known to be low. In servicing larger areas and larger number of farms than included in the sample areas some heavier conductor would have to be included. The additional cost might raise the over-all average to $600 per farm connected.

(8) In interpreting the estimates other important considerations include the use of 1943 prices for materials, the possibilities of raising the saturation above 54%, the assumption of free easement and the omission of organizing and surveying costs, the limitations imposed by the type of line selected and the added costs of providing a more elaborate service.

(9) It was estimated that increased saturation to 71% by

connecting all farms within one-half mile of the line would reduce the over-all average cost per farm from $576 to $519.

(10) The average length of tap-off for 380 farms in 10 sample areas was 470 feet. The cost of servicing individual farms is appreciably affected by the length of tap-off. Tap-off and service costs vary from $183 for less than 50 feet to $410 for distances of over 2,150 feet.

CHAPTER V

OPERATING COSTS AND ENERGY COSTS FOR FARM DISTRIBUTION SYSTEMS

The purpose of this chapter is to present estimates of the operating costs and energy involved in providing farms with electric power. Only scanty information is available on which to base an estimate of operating costs for farm service in Alberta. In arriving at an estimate considerable reliance was necessarily placed on such cost data as the utilities operating transmission lines were able to furnish. These data, based upon the operation of high-voltage transmission lines and the provision of service to hamlet, village, town and city users, can have only limited applicability to a system of farm distribution lines. Close attention was also given to the estimates provided in the Report of the Manitoba Electrification Enquiry Commission. It will be seen that the estimate of total operating expenses per farm customer per month is the same as the Manitoba estimate based on 60% saturation. The cost of energy at the farm is based on data provided by the utilities with transmission systems in the Province.

OPERATING COSTS PER FARM PER MONTH.--For purposes of comparison the Alberta and Manitoba estimates of operating costs per farm per month are set out below (Table 27).

Table 27.--Alberta and Manitoba Estimates of Operating Costs

	Alberta Estimates	Manitoba Estimates
	$	$
Farm Line Operating Expense	0.89	1.09
Billing and Collections	0.35	0.14
Education and Promotion	0.10	0.08
Administrative Expenses	0.65	0.68
	1.99	1.99

Farm line operating expense includes salaries and travelling expenses of men engaged in patrolling and servicing lines; materials for repairs, and maintenance of meters and transformers. The Alberta estimate of 89 cents per customer per month is based upon data provided by the utilities. The Manitoba estimate is 20 cents a month higher. With reference to line operating expense the Manitoba Report states, "The estimate of farm line operating expense is based on the experience of the Manitoba Power Commission with lines of similar design. It assumes a considerable amount of cooperation from the farm customer, but no more than has been customary with the R. E. A. cooperatives in the United States. It is impossible to give farm service at reasonable rates and at the same time have a large staff of employees continuously patrolling farm lines or making long trips in response to minor trouble calls. This fact must be well understood at the outset and arrangements made for smoother working cooperation between the farm customer and the local district supervisor."

The Alberta estimate for billing and collections is based on average costs of servicing customers in hamlets, villages, towns and cities as determined by the utilities operating in Alberta. The estimate of 35 cents per month is clearly too low if farm meters are to be read and collections made monthly as in urban centres. On the other hand it is felt that the Manitoba estimate of 14 cents per month is unduly low. On this point the Manitoba

Report states "Distance does not permit the same procedure for meter reading as prevails in towns and villages. A thoroughly tested system in which the customer reads his own meter and forwards the information with payment regularly on a special card has been in successful operation for several years in the United States. With this system it will be possible to perform the billing and collection operations at a cost of 14 cents per farm customer per month." It is apparent that there are various possible arrangements whereby the costs of billing and collecting accounts might be reduced, but the extent to which this item can be reduced in practice is difficult to predict. Reliable information could only be obtained through experience. It is obviously desirable that means of reducing the item should be thoroughly explored under actual conditions of operating farm lines in Alberta.

If the Alberta estimate for billing and collection is higher than it might be, the estimate for education and promotion, although slightly higher than the Manitoba estimate, is undoubtedly too low if farm consumption is to be built up to the levels necessary to ensure low costs and low rates. The Manitoba estimate does not include "the intital business promotion work". "It is estimated that for 25,000 farms, which is the assumed number of customers in the tenth year, $24,000 per annum will be sufficient for the work." Undoubtedly the greatest emphasis would have to be placed on educational and promotional effort during the first year or two after the farm is connected. Initially the farmer is likely to install only a few appliances and if the consumption is to be built up he must be shown the ways in which power can be effectively utilized on his own farm. But educational and promotional work which involves

visits to farms is unavoidably costly; and it appears that little of this close contact with the farm customer would be possible with an expenditure of about $1 per customer per year. The sum of $24,000 a year might be sufficient to keep four qualified men in the field. Assuming 250 man days per year actually used for visiting farmers, and 25,000 farmers to visit, each man would have to call at an average of 25 farms each day. Little useful educational and promotional work could be done on this basis. The problem of education and promotion is referred to again later in this Report.

General and administrative expenses, including the expense of central office administration, are estimated at 65 cents per customer per month. The comparative Manitoba estimate is 68 cents. Neither estimate includes taxes which private companies might have to pay.

The estimate of $1.99 per customer per month is used later in this Report for purposes of determining necessary rates. It must be emphasized, however, that an adequate basis for estimating operating costs of farm distribution lines in Alberta can only be provided by experience; and that, if rates are to be maintained at levels which will make extensive farm electrification possible, there is need to explore every possible avenue of reducing those costs of operation which must be charged in the monthly bill.

COSTS OF ENERGY.--The cost of energy at the farm depends on the cost of generating and the line losses over the transmission and distribution systems. The cost of generating energy is assumed to be 1.00 cents per kwhr at the generating plant; and line losses between the plant and the farm are estimated to average 40%. These estimates are based on information provided by the utilities. Due to lack of experience in the operation of farm lines of the type proposed line losses are uncertain but the estimate of 40%

checks closely with information covering R. E. A. systems in the United States. Manitoba estimates of energy costs are based on the assumption of an average loss of 50% between Winnipeg and the point of delivery at the farm. On the basis of 1.00 cent per kwhr at the plant and line losses of 40% the cost per kwhr at the farm would be 1.65 cents.

The estimate of 1.65 cents per kwhr is high in comparison with the Manitoba estimate of 0.75 cents. The Manitoba Power Commission now purchases power from the Winnipeg Electric Company, the price at Winnipeg being established by an agreement of 1928 between the Minister and the Company. The average price in 1941 was 0.363 cents per kwhr. The estimate of 0.75 cents is based on the assumption that the price established under the existing agreement will continue to apply. Further, although the actual basis of determining the price established by agreement is not clear, it does not appear to have been established solely on the basis of a consideration of the over-all costs of generating power. The Alberta estimate of 1.00 cents per kwhr would enable the utilities generating power to recover the costs of generating; and appears to be comparable to the price paid for power purchased by the R. E. A. systems in the Western States. The average price paid in each of ten Western States is shown below (Table 28).

Table 28.--Average Price Paid for Energy Purchased by R. E. A. Systems in Ten Western States

State	Average Price of Energy Purchased per kwhr
	¢
Colorado	1.04
Idaho	1.04
Iowa	1.24
Kansas	1.16
Minnesota	1.24
Montana	1.06
Nebraska	0.91
North Dakota	1.01
South Dakota	1.23
Wyoming	1.24

As the above prices are paid for power at some point on the utilities transmission lines, and the cooperatives distribute the energy over their own farm distribution lines, they are not quite comparable to either of the Alberta estimates of 1.00 cents at the generating plant or 1.65 cents at the farm. As line losses are lower on the transmission lines the R. E. A. prices are probably more nearly on a basis of comparison with the estimate of 1.00 cents at the generating plant.

COMBINED OPERATING AND ENERGY COSTS.--The estimates of operating and energy costs would represent the following costs (exclusive of capital charges) per customer per month at different levels of consumption, assuming constant operating costs regardless of the level of consumption (Table 29).

Table 29.--Operating and Energy Costs at Different Levels of Consumption

Monthly Consumption	Operating Costs per Month	Energy Costs per Month	Operating and Energy Costs per Month
kwhr	$	$	$
20	1.99	0.33	2.32
30	1.99	0.50	2.49
40	1.99	0.66	2.65
50	1.99	0.83	2.82
60	1.99	0.99	2.98
70	1.99	1.16	3.15
80	1.99	1.32	3.31
90	1.99	1.49	3.48
100	1.99	1.65	3.64
200	1.99	3.30	5.29

Total costs would include in addition the monthly fixed charges for interest and depreciation. These charges are discussed, under the heading of 'alternative projects', in Chapter VI.

SUMMARY.--(1) Operating costs including farm line operating expenses, billing and collection, education and promotion, and general and administrative expenses, are estimated at $1.99 per customer per month.

(2) The estimate of total operating costs, exclusive of energy costs, is the same as that of the Manitoba Electrification Enquiry Commission; although the individual items vary.

(3) An adequate basis for estimating operating costs of the proposed type of farm distribution line, in Alberta, can only be provided by experience.

(4) Energy costs at the generating plant are estimated at 1.00 cent per kwhr. Average line losses are assumed to be 40%. The estimated cost of energy at the farm is therefore 1.65 cents.

(5) Combined operating and energy costs per customer per month would vary from $2.32 with a consumption of 20 kwhr per month to $3.64 with a consumption of 100 kwhr per month.

CHAPTER VI

FARM ELECTRIFICATION PROJECTS IN ALBERTA

Estimates of construction costs, operating costs, and energy costs have been presented in preceding chapters. Costs per customer per month and necessary rates would depend upon the scope of any project, that is, upon the number of farms it was designed to serve, and upon the areas in which service was to be provided. This chapter deals with the costs involved in an extensive scheme designed to connect approximately 30,000 farms; and rates necessary

to cover all costs are indicated. In addition the effect of alternative methods of financing are considered; and, finally, reference is made to the effect on costs of confining the project, at least initially, to a more restricted area and to a smaller number of farms.

AN EXTENSIVE SCHEME OF FARM ELECTRIFICATION.--It was pointed out in Chapter III that the tentative potential service area described there was defined so as to include all existing transmission lines. It is estimated that the type of line proposed for farm electrification (Chapter IV) would carry power to farms at a distance of 12 miles on each side of the transmission line. The number of farms within this distance from the existing transmission lines, and within the tentative potential service area, is estimated to be 55,254 farms, or 55% of all farms in the Province.

The parts of the tentative service area which could not be covered from existing transmission lines are on the north and north-west fringes of settlement (south of the Peace River district), and between existing lines in the north-east portion of the settled area. In addition to these parts, in which conditions for farm electrification are relatively unfavourable, there are only three small gaps in the central and south-west portion of the Province. These gaps occur around Carseland, in the vicinity of Torrington and Wimborne, and around Donalda. Farms located within these gaps could be served immediately in either of two ways, namely, by the extension of transmission lines of by using heavier conductors in the farm distribution lines. Either method would involve some additional cost. The estimate of 55,254 farms within twelve miles of transmission lines includes the farms in these

three small gaps, on the assumption that if the project were carried out over ten years, transmission lines would be extended to the towns before the end of the period.

Number of Farms and Construction Costs.--In estimating the number of farms which might be connected under this project, the proportions of farms assumed to be connected in the sample studies were applied to each of the 16 districts. The areas distant from transmission lines, and therefore excluded from this project, are generally poorer than those included. If the sample areas are representative of each district, the use of the sample areas would tend somewhat to underestimate the number of probable farm customers initially connected.

The estimated connections in each of the 16 districts, and for all districts, are shown in the following table (Table 30).

Table 30.--Estimated Number of Farms Connected, by Districts

District	Estimated Farms in the District	Estimated Farms Within 12 Miles of Transmission Lines	Estimated Proportion of Farms Connected	Estimated Number of Farms Connected
	No.	No.	%	No.
I	770	630	54[1]	340
II	3,550	3,454	41	1,416
III	7,399	7,028	59	4,147
IV	1,581	1,581	38	601
V	4,077	3,468	62[2]	2,150
VI	3,388	3,061	47	1,439
VII	4,494	4,494	56[2]	2,517
VIII	4,487	3,536	69	2,440
IX	5,581	3,765	62	2,334
X	8,189	7,750	42	3,255
XI	5,587	3,638	57[2]	2,074
XII	3,823	3,803	79	3,004
XIII	1,967	1,124	57	641
XIV	5,421	2,852	34	970
XV	6,064	3,185	43	1,370
XVI	2,438	1,885	59	1,112
All Districts	68,816	55,254	54	29,810

[1]As a sample study was not made in District I, the average saturation for all samples was used.

[2]In each of these districts two sample studies were made. The average saturation has been used in each case.

In estimating the total costs of farm distribution line construction for the 29,810 farms, the average cost per farm, based on the sample surveys in each district, was used. It is probable that this procedure slightly over-estimates the costs in those districts in which only a portion of the whole district would be served. The estimates of total costs, by districts and for all districts, are shown below (Table 31).

Table 31.--Estimated Total Construction Costs, by Districts

District	Estimated Number of Farms Connected	Estimated Cost per Farm	Estimated Total Construction Costs
	No.	$	$
I	340	760.00[1]	258,400
II	1,416	455.68	645,243
III	4,147	605.86	2,512,501
IV	601	700.15	420,790
V	2,150	567.83	1,220,835
VI	1,439	759.46	1,092,863
VII	2,517	608.52	1,531,645
VIII	2,440	512.61	1,250,768
IX	2,334	653.20	1,524,569
X	3,255	616.42	2,006,447
XI	2,074	628.23	1,302,949
XII	3,004	464.03	1,393,946
XIII	641	590.14	378,280
XIV	970	589.48	571,796
XV	1,370	655.15	897,556
XVI	1,112	649.31	722,033
All Districts	29,810	594.79	17,730,621

[1] As no sample study was made in District I, no estimate of the cost of connecting farms in this district was available. In view of the large size and low density of farms the average cost of $760 was assumed.

The estimated average cost for all farms connected is $594.78. In interpreting this estimate the considerations which were noted as important in connection with the earlier estimate of $575.87, are again relevant in this case. For purposes of further estimation, it will be assumed that the number of farms to be connected is 30,000; the average cost per farm $600; and the total construction cost $18,000,000.

Capital, Operating, and Energy Costs.--Capital charges, per annum or per month, include interest and depreciation. In estimating capital charges it has been assumed that funds will be available for financing such post-war projects as farm electrification, at 3 per cent. per annum. On a construction cost of $600 per farm, this represents $18.00 per farm per year, or $1.50 per farm per month. At 5 per cent. per annum interest charges which would have to be covered in the user's bill would amount to $30 per farm per year, or $2,50 per farm per month. The availability of funds at low rates of interest would therefore make an appreciable difference to costs and consumption rates. The average life of farm distribution lines is estimated to be 25 years, representing a straight line depreciation rate of 4 per cent. per annum. However, as pointed out in the Manitoba Report, with provision for a sinking fund, and if earnings at 3 per cent. were allowed to remain in the fund, an annual levy of 2.75 per cent. would provide for the recovery of the capital cost over the life of the lines. It is therefore assumed that provision for line replacement would be made through a sinking fund, and the rate of 2.75 per cent. per annum has been used to cover depreciation. This represents $16.50 per farm per year, or $1.38 per farm per month. At 4 per cent. per annum depreciation charges would amount to $24 per farm per year, or $2.00 per farm per month. The use of the sinking fund arrangement would then make an appreciable difference to costs and rates.

On the basis assumed total annual charges on fixed capital would amount to $24.50 per farm per year; or $2.88 per farm per month. Operating expenses, excluding the cost of energy, are taken to be $1.99 per customer per month; (Chapter V). Total

expenses per customer per month, excluding energy, are therefore $4.87.

The cost of energy is assumed to be 1.65 cents per kwhr at the farm (Chapter V); and estimated total costs, including energy costs, for different levels of monthly consumption, are shown below (Table 32).

Table 32.--Total Costs per Month at Various Levels of Consumption

Monthly Consumption	Capital and Operating Costs	Cost of Energy	Total Costs
kwhr	$	$	$
20	4.87	0.33	5.20
30	4.87	0.50	5.37
40	4.87	0.66	5.53
50	4.87	0.83	5.70
60	4.87	0.99	5.86
70	4.87	1.16	6.03
80	4.87	1.32	6.19
90	4.87	1.49	6.36
100	4.87	1.65	6.52

Rates.--Assuming that total costs, as estimated, were to be met out of revenue from the sale of power to farm users, the following rates would appear to be necessary:

Minimum net monthly bill of $4.80 up to 20 kwhr. (Discount at 10 per cent. off the even dollar.)
Additional consumption over 20 kwhr - 3 cents net.

With the above rates the monthly total cost, net revenue, and gain or loss per customer, at various levels of consumption, would be as set out below (Table 33).

Table 33.--Gain or Loss per Customer at Various Levels of Consumption

Monthly Consumption	Total Cost	Net Revenue	Gain or Loss
Kwhr	$	$	$
20	5.20	4.80	-0.40
30	5.37	5.10	-0.27
40	5.53	5.40	-0.13
50	5.70	5.70	0.00
60	5.86	6.00	+0.14
70	6.03	6.30	+0.27
80	6.19	6.60	+0.41
90	6.36	6.90	+0.54
100	6.52	7.20	+0.68

With the rates suggested, estimated costs might be covered when average consumption reached 600 kwhr per year. The difficulty of estimating probable consumption per farm has been discussed earlier in this Report (Chapter III). Under an extensive scheme projected over a ten year period with new connections being made each year, the point in the development of the scheme at which an average consumption of 600 kwhr could be reached would depend upon two factors; first, the rate at which consumption on individual farms could be built up, and second, the manner of the selection of areas to be served in successive years. The rate at which consumption on individual farms could be built up depends upon farm incomes, prices of appliances, and the amount of effort expended on education and promotion. The selection of areas would affect both costs and revenues. In better areas, that is areas of greater density of farms and of more prosperous farms, higher saturation, lower construction costs per farm, lower operating expenses per farm, and higher consumption per farm would be experienced.

Assuming reasonably favourable income condition, if poor or even average areas were served first, and little effort was expended on education and promotion, average consumption of 600 kwhr might not be reached for a number of years. On the other hand, if better areas were served early, and if an effective programme of education and promotion were undertaken from the outset, operating gains might be shown early in the development of the project and reserves accumulated against the connection of farms in poorer areas in later years.

The assumption that these rates would be sufficient to cover total costs implies, first, that the costs would be no greater than

those estimated, and second, that bills based on the rates stipulated would be regularly collected. While the estimates are thought to provide a reasonable basis for decisions, it must be emphasized that there is, in regard to both costs and anticipated revenues, a substantial element of uncertainty.

Alternative Methods of Financing an Extensive Scheme.--In the preceding outline of the costs, revenues and rates for a programme of electrifying 30,000 farms in ten years, it has been assumed that all estimated costs are charged to the users, and that rates are sufficient to provide revenue to cover all costs. Two alternative arrangements are referred to below. In the first case, (1) it is assumed that one-half of the capital charges are met out of the general revenues of the Province. The second arrangement (2) would provide for the participation of local government units in the provision of power to farms within the territories under their jurisdiction. The general principle in the latter arrangement is that costs of construction, or the capital charges resulting from construction costs, would be shared between the provincial and local governments.

(1) The arrangement provided for here would be similar to that recommended by the Manitoba Electrification Enquiry Commission; and comparable to the arrangements for the provision of provincial grants-in-aid through the Ontario Hydro Commission. The existing arrangement in Manitoba, and the recommendation of the Enquiry Commission are set out in the following paragraphs:

> "The Manitoba Power Commission Act requires that all moneys received by the Province since the first day of May, 1929, as rentals from leases for water powers shall be paid into and form part of the consolidated fund; and the proceeds of such payments, after deducting the cost of administering such water powers, shall be credited to the Manitoba Power Commission extension account.

> "On the recommendation of the Commission, and with the approval of the lieutenant-governor-in-council, an amount may be withdrawn each year from the extension account sufficient to pay the interest and sinking fund charges on one-half of the capital costs of the properties required for generation and transmission of power to municipalities, farmers, and other persons. The distribution properties of the urban communities are not eligible for bonus."

The Manitoba Enquiry Commission points out that revenue from rentals would not be sufficient to provide a similar bonus to farm distribution lines under the scheme it proposes, but recommends

> "That farm electrification should be governed by the same legislation which is now embodied in the Manitoba Power Commission Act. This Act has been taken as a guide in assessing the extent to which the Province of Manitoba will give financial aid to the farm project. It provides for a bonus equal to the interest and sinking fund on one-half the capital. It may be expressed equally well as one-half the interest and one-half the sinking fund on the total capital."

Applying this principle of provincial assistance to the Alberta estimates, the reduction in cost per customer per month would be $1.44, and this amount could be deducted from the minimum net monthly bill of $4.80. The bonus would be equivalent to $17.28 per farm customer per year; and, at the end of ten years with 30,000 farms connected would, in the aggregate, amount to $518,400 a year.

(2) The arrangement referred to here is one which would provide for participation, in the provision of power to farms, of both provincial and municipal governments. The principal may be illustrated by assuming that, as in (1) above, one-half of the capital charges is met from the general revenues of the Province, and that the remaining one-half of the capital charges is met out of the municipal revenues. Applying this principle to Alberta estimates the reduction in cost per customer per month would be $2.88, and this amount could be deducted from the minimum net monthly bill of $4.80. The combined contribution through both

provincial and municipal governments would be $34.56 per farm customer per year; and, at the end of ten years with 30,000 farms connected the provincial contribution would aggregate $518,400 a year, the contribution through municipal governments being the same.

ALTERNATIVE AND LESS EXTENSIVE SCHEMES.--The extensive project discussed above would provide for substantially complete coverage of the potential service area. A less extensive scheme, or one projected over a shorter period of years, might appear preferable. Restriction of coverage would affect costs, and therefore rates necessary to cover costs.

Even under the extensive scheme already considered a measure of selection of areas is involved in the definition of a potential service area, and in the coverage of those areas which could be reached off existing transmission lines. These limitations are imposed with a view to keeping down construction costs per farm connected, through the selection of areas in which the number of potential customers per mile is relatively high and in which no new transmission line construction would be involved. Within the areas thus selected substantial differences in the numbers of potential customers per mile are apparent, both as a result of differences in density of farms and also of the apparent willingness and ability of farmers to take and pay for power. Although the potential service area was defined on a geographic basis, it might have been defined on the basis of density of potential customers. The sample surveys suggested a general average, within the area, of 1.35 customers connected per mile of line, or 0.74 miles per customer.

The coverage of less extensive projects might be defined on the basis of customers initially connected per miles, or of potential customers per mile; and by increasing the requirements the area to be served could be reduced. Projects limiting service to more favourable areas would encounter lower construction cost per customer, and therefore lower capital charges. Operating expenses would also be somewhat reduced as a result of lower expenses for patrolling and servicing lines per customer. Reduced capital charges and operating expenses would have a significant effect on rates necessary to cover costs.

It is estimated, for example, that if service were provided only in those areas which at the outset could connect 1.75 customers or more per mile, construction costs might be reduced to approximately $500 per farm, and that it would be possible to connect 10,000 farms on this basis. The reduction in construction costs per farm from $600 to $500 would reduce capital charges from $2.88 to $2.40 per customer per month. Assuming a reduction of 20 cents per customer in operating expenses, total costs excluding energy would be $4.19 per farm per month compared with $4.87 for the more extensive scheme. The difference of $0.68 per customer per month would make possible a corresponding reduction in the minimum net monthly bill, reducing it to $4.12. Further, as a result of the selection of more favourable areas it would be reasonable to expect that additional connections could be made more rapidly, consumption per farm would be higher, and the individual farm load could be built up more quickly. These possibilities also suggest lower rates.

SUMMARY.--(1) It is estimated that 29,810 farms could be initially connected from existing transmission lines. The average

cost of construction (excluding wiring of buildings) is estimated at $595. The saturation would be 54 per cent.

(2) On the basis of 30,000 farms at $600 per farm the total cost of construction would be $18,000,000.

(3) Capital charges, with interest at 3 per cent. and depreciation sinking fund levy at 2.75 per cent., would be $2.88 per customer per month, and operating expenses, excluding energy, would be $1.99 per customer per month. With energy costs 1.65 cents per kwhr at the farm, total costs per customer per month would range from $5.20 at 20 kwhr to $6.52 at 100 kwhr.

(4) If all costs were to be covered out of revenues, rates necessary to provide for this are illustrated by the following rate schedule: minimum net monthly bill of $4.80, up to 20 kwhr (discount at 10 per cent. off the even dollar) and 3 cents net per kwhr for all energy over 20 kwhr.

(5) Rates as suggested would provide revenue equal to costs at a monthly consumption of 50 kwhr.

(6) Alternative methods of financing are suggested.

(a) If one-half the capital charges were met out of general provincial revenues, this would reduce the monthly cost chargeable in the user's bill by $1.44.

(b) If all capital charges were shared between the provincial and local governments, this would reduce the costs chargeable in the bill by $2.88 per month.

(7) Construction costs, capital charges, and operating expenses per farm could be reduced if the areas served were restricted on the basis of potential customers per mile. It appears that, if an initial of 1.75 customers per mile were required, construction costs per customer might be reduced to approximately $500 per farm,

and that 10,000 farms might be connected on this basis. Under these conditions, lower operating expenses, higher consumption per farm, and more rapid increase in load would also influence the rates necessary to cover costs.

CHAPTER VII

FARM ELECTRIFICATION IN ALBERTA: SOME FURTHER CONSIDERATIONS

The main purpose of this Report has been to present estimates of the costs involved in the development and operation of farm power distribution systems, and to suggest rates which might be expected to cover costs under alternative methods of financing. Costs and rates have been discussed in Chapters IV, V and VI. There are however, a number of other matters, not already dealt with or merely touched upon in passing, which are important in relation to farm electrification. These are referred to briefly in this concluding chapter.

ADDITIONAL COSTS TO FARM USERS.--The costs referred to in earlier chapters include all costs involved in taking power from existing transmission lines to farm buildings. But, before the farmer can avail himself of the service which would thus be provided, he must wire his house and other buildings, and install appliances and equipment.

The cost of wiring farm buildings would vary between farms, depending upon the number of buildings wired and on the number and type of appliances installed. The Manitoba Enquiry Commission recommended a minimum package of appliances the estimated cost of which included an allowance of $150 for wiring the house and outbuildings. Reports obtained in the Alberta surveys from farmers using individual plants showed an average cost of wiring of $125. In view of the limited service secured from many of the individual

plants and the restricted range of appliances installed, this latter estimate is probably too low. It appears that the average cost of wiring buildings under an extensive farm electrification project, and assuming the appliances necessary to secure an adequate level of consumption, would not be less than $150, based on past experience and prices.

The cost of appliances would likewise vary greatly between the farm with lights and a few household appliances, and the farm with equipment for a variety of domestic and farm uses. It appears possible that under favourable conditions of farm incomes and with customary prices for appliances, the average initial cost of installations might amount to $300 per farm. For the average farm therefore wiring and appliances together might represent an initial investment of $450.

Even under favourable conditions of farm incomes not all prospective farm users would be in a position to provide, without borrowing, for an initial investment of $450. As pointed out elsewhere in this Report, in the Province of Ontario and under the R.E.A. Systems in the United States, assistance to farmers in wiring of buildings and purchase of appliances is given through the provision of loans at low rates of interest. On the other hand, the Manitoba Enquiry Commission, while recommending some action with regard to the prices of farm appliances, reported "Unless all other methods fail, it is not considered advisable that the province finance the farmer's purchases of wiring and appliances".

If, and when, farmers are approached to secure from them a contract for the purchase of power, it should be possible to provide them with a reliable estimate of the cost of wiring their buildings. This implies a substantial measure of standardization

of materials and labour charges, and adherence to a defined electrical code. If an extensive programme of farm electrification were undertaken it would therefore be desirable, and should be possible, to secure a degree of standardization in the matter of wiring, which might assist materially in reducing costs. Standardization of appliances and the development of appliances adapted to the peculiar requirements of the farm and farm homes, are perhaps even more important considerations. Again, the projection of an extensive scheme over a period of years would seem to add to the possibility of developments in this desirable direction; thus contributing to bringing prices within the ability of the farmer to purchase them, and to building up farm consumption of power.

Every possible means of reducing the cost of appliances might with advantage be investigated. The Manitoba Enquiry Commission recommended that "The government institution operating the farm electrification system act as the agent between the manufacturer and the consumer, so that goods may be sold to the farmer at as near factory cost as possible", and that wiring and equipment should be offered to the farmer in these standard packages. The idea of the standard package seems to have much to commend it; and perhaps particular consideration might be given to arrangements for the sale of a package which would ensure a minimum initial consumption consistent with the rate schedule established.

NET COSTS TO THE FARM USERS.--The total costs to the individual farm user include the capital investment in wiring and appliances, the maintenance and replacement of these, and the monthly bill for service. Against these must be set the disposal value of appliances and equipment which would be displaced, the reduction or elimination of maintenance expenses in connection with existing

equipment, and the reduced expenses for alternative sources of power.

In many cases existing equipment might have little disposal value; in other cases the conditions of disposal might greatly influence the decision of the farmer. The opportunity for load-building under an extensive programme of farm electrification would therefore be enhanced if appropriate measures were taken to organize the market for such second-hand equipment as might be displaced through the shift-over to electric power.

Accurate information on the actual expenses of operating various appliances, under conditions on the average farm, is difficult to secure. It is therefore not possible to provide any reliable estimate of the reduction in out-of-pocket expenses which might accompany a shift-over to the use of electric power. The installation of electric light, an electric motor for pumping water or operating a washing machine, and an electric radio would reduce expenses for fuel, oil, and batteries; in addition to saving time and effort. How far this would go, having in mind also the maintenance and replacement costs in each case, in providing for the monthly electricity bill, cannot be demonstrated. There seems to be little doubt that, on many farms, a net reduction in out-of-pocket expenses would result even with a net monthly minimum bill of $5. But it may be difficult to convince the farmer that this is so.

Before the individual farmer can be induced to make the substantial investment involved in changing over to electric power he is likely, in many cases, to demand a demonstration of the savings which will result. The object of an educational and promotional programme would be to discuss with individual farmers the effects of the

substitution of electric power and equipment for the existing facilities, under their own particular conditions, and to induce such changes as would appear to be to their advantage. In this connection more, and more accurate, information with regard to the costs of operating various appliances under farm conditions in the Province of Alberta would appear necessary.

NON-FARM RURAL USERS.--Extension of farm distribution lines would bring within reach of service non-farm customers in small hamlets and scattered throughout farming areas.

The proportion of non-farm rural population in the potential service area defined for purposes of this study was over 10 per cent. However most of the larger hamlets in the area are already served with power. The ratio of non-farm to farm population in the areas which would be traversed by farm distribution lines is undoubtedly smaller. Assuming that the number of non-farm domestic users might represent 16 per cent. of the number of farms connected, the extension of farm lines to 30,000 farms would bring service to 4,800 non-farm domestic users. In addition schools, churches, community halls, stores, and perhaps other commercial and industrial users might be connected. The average consumption per customer (domestic, commercial, and industrial) in hamlets now served appears to be about 750 kwhr (Chapter I). The increase in load resulting from the connecting of non-farm users would not therefore likely be great.

The serving of non-farm users might, in some cases, involve some modifications in line construction with a tendency to increase construction costs per mile. On the other hand, the inclusion of non-farm users would increase the number of customers per mile; and, particularly where more than one could be served off a single

transformer, would reduce the cost of construction per customer.

THE TENANT FARMER.--The rented farm presents a special problem; and in some areas the proportion of rented farms is high. The following table summarizes the available data on proportion of rented farms (Table 34).

Table 34.--Proportion of Rented Farms, by Districts

District	Proportion of Tenant Farmers in the District 1936 Census	Proportion of Tenant Farmers in the Sample Areas, 1943
	%	%
I	14	--[1]
II	28	21
III	30	44
IV	20	33
V	21	23 and 5
VI	25	32
VII	23	28 and 9
VIII	13	15
IX	19	32
XI	15	16 and 6
XII	15	4
XIII	10	13
XIV	8	16
XV	9	3
XVI	18	4

1/ No survey made in District I.

Farm leases are generally of so short duration and tenant farmers have so little certainty of tenure that they are likely to be unwilling, in most cases, to wire buildings and install appliances without some agreement with and assistance from the landlord. Many landlords may be unwilling to provide for the electrification of rented farms because, under the prevailing crop-share rental system, it is difficult to make adjustments for improvements of this kind, and the principal effect of electrification may not be on crop production. It is true that the landlord who assists in the electrification of his farm will tend to attract the better tenants; but this advantage may appear

too uncertain and remote to influence many landlords. There is little doubt that the development of a successful farm electrification scheme in any particular area will enhance the value of land in the district; and this becomes espicially significant where a substantial part of the construction cost is borne out of general revenue. In view of this there would seem to be a case for charging part of the capital costs to all land owners in a district served with power.

"SELF-HELP".--There appear to be advantages in securing some user participation in, and responsibility for, the development and operation of farm distribution lines. For example, regardless of the method of organizing the distribution of power to farms, the prospective users might be expected to participate in the initial organizational activities and thus to reduce the expenses of surveying and securing contracts; to assist, through local organization, in the educational and promotional programme designed to build up consumption; to assist in reducing the expenses connected with billing and collections, and possibly with patrolling of lines; to make some provision for repairs to appliances and wiring on farms. Further, some financial responsibility for maintenance and replacement might develop a collective interest in keeping these costs at a minimum.

In connection with the possibilities of self-help and reduction in expenses through farmer participation in actual construction and operation, it must be remembered that much of the work requires a high degree of skill, and many of the tasks are hazardous.

With reference to R. E. A. cooperatives organized on a self-help basis the report of the Manitoba Enquiry Commission has this

comment.

> "For the most part these self-help projects have not reduced the costs of constructing the lines materially below the figure that the R. E. A. has achieved in the non-self-help projects. This is true for two reasons. In the first place, even the ordinary cooperative projects rely very heavily upon member interest in promoting saturation and educational work. In the second place, in most instances where self-help is relied upon the workmen who are members of the cooperative are paid at local rates for whatever work they do. Thus the actual dollar saving is not substantial in most instances. Nevertheless, the self-help project has the great advantage of helping farmers earn money or credits in their spare time which will help to defray the cost of wiring their buildings and purchasing their initial appliances. This has the further advantage of achieving a somewhat higher saturation of members along the line and of getting a higher saturation of appliances in use from the beginning."

ARREARS, DISCONNECTIONS AND BAD DEBTS.--The problem of the user who gets behind in the payment of his bills is always troublesome. It might well prove unusually so in the case of farm users under an extensive system of farm distribution lines.

The cash income received by farmers is relatively irregular, highly variable, and even under normal conditions is low in comparison with urban users. At certain times of the year, and particularly in **districts dependent** on sale of crops, little cash is available on farms. Individual farmers suffer unexpected reverses, and whole districts may be affected by unfavourable weather conditions. Producers generally may have their incomes seriously reduced by price declines. Complete security from these hazards may not be possible through measures designed to stabilize incomes. Some part of the problem is likely to remain.

At the same time, because of the large investment per user and the relatively large fixed carrying charges, the disconnection of farms and loss of revenue, are particularly serious in the case of farm distribution systems; both to the organization operating the system and to the individual farmer who has changed-over some

of his equipment to the use of electric power.

The problem could be lessened in either of two ways. First by measures designed to stabilize farm incomes, and second, by inducing individual users, during periods when cash is available, to accumulate reserves, through advance payments into a fund which could be drawn upon at other times. If farms were connected during a period of favourable conditions it might be in the interests of farm users themselves and of the successful operation of the lines, to have a substantial interest-bearing deposit made by the customer at the time the farm lines were built.

EDUCATION AND PROMOTION.--Reference has been made from time to time in this Report to the need for a programme of education and promotion if any extensive project of farm electrification were to be possible, and if consumption were to be built up to the point which would ensure successful operation. In the discussion of operating expenses it was pointed out that the allowance of 10 cents per customer was much too low if educational and promotional work were to be effective.

Really effective promotional and load-building work can only be done on the individual farm. At the time when contracts are being secured the prospective customer should be informed as to the terms on which power can be secured, the cost of wiring his buildings; the cost of appliances; the power consumption of different appliances; the uses to which power could with advantage be used under his particular conditions; the adjustments in the lay-out of his farm which would make more effective use of power possible; the arrangements available to assist him in making the change-over; and other matters. All this involves time on the farm, and qualified

persons on the job. Moreover, everything cannot be accomplished at the outset, and continuous contact might advantageously be maintained with the customer for a few years. Thereafter less frequent and less prolonged visits to the farm might be sufficient.

Other extension and demonstration methods would also require to be used including literature, the radio, group meetings, and demonstrations at central points.

As already suggested with reference to the determination of net costs to the user involved in the change-over to electric power, much information of use to the farmer and to the administrator is not now available. During the early years of any project it would be desirable to provide for the accumulation and dissemination of this information, which might be secured through experimental and research work, field enquiries, the electrification of demonstration farms, and the metering of individual appliances.

It has been suggested that some measure of participation by the users in the various functions involved in development, maintenance, and operation of lines would have advantages. Apart from this serious loss of time an added expense would result if it were necessary to bring electricians long distances for minor repairs to equipment and appliances on farms. To avoid this it would be helpful to develop among farm users a level of technical knowledge which they would not at the outset possess. This would call for special schools of instruction, and perhaps for a larger measure of instruction in this field in rural schools.

INDIVIDUAL FARM PLANTS.--It was pointed out earlier in this Report that of the, approximately, 5,500 farms in Alberta reported as having electric power, apparently some 5,000 have individual farm plants, either wind-or gasoline-driven. Information received from

distributors suggests that perhaps 4,500 of the individual plants are driven by gasoline engines; although, in some areas, where wind frequency and velocity are favourable, the proportion of wind-driven plants is considerably higher.

Reference was made in Chapter II to the fact that farmers with individual plants expressed themselves as well-satisfied with the service they were receiving; and it is apparent that these plants perform a useful and valuable service. However, the rate of installation of individual plants has not, in the past, been such as to suggest that, under similar conditions, any high level of saturation could be expected in the future.

The wind-charged plant requires no fuel and less attention than does the gasoline-driven plant; and consequently operating costs are lower. But service may be less dependable, as this is influenced by the occurrence and velocity of winds and the size and condition of the batteries. There are probably substantial areas of the Province in which the wind-charged plant would prove unsuitable.

Some estimates of costs of operation of the two types of plant were obtained during surveys in Alberta. These are summarized below (Table 35).

Table 35.--Survey Estimates of Costs of Operating Individual Farm Plants

	Average Annual Cost of Operation	
	31 Gasoline Plants	11 Wind Plants
	$	$
Depreciation:		
Plant	13.50	4.00
Batteries	29.79	25.00
Maintenance	3.06	1.00
Operation	40.69	.50
Total	87.04	30.50

The type of plant varied in each case. The average initial cost for gasoline-driven plants and batteries was about $400; and the average cost of wind-driven plants and batteries was about $340. Several of the units, particularly among the wind-driven plants, were small and capable of providing only a very limited service. For this reason the costs shown cannot reasonably be compared with the cost of service off farm distribution lines.

To meet the standard of service which could be supplied by farm distribution lines a capacity of at least 1,000 watts would be required. After a study of available reports on operating costs of individual plants, the Manitoba Enquiry Commission offered the following estimates of costs for plants of this capacity (Table 36).

Table 36--Manitoba Enquiry Estimates of Costs of Operating **Individual Farm Plants**

		Gasoline-Driven Plants	Wind-Driven Plants
Size	Watts	1,500	1,000
	Volts	32	32
Battery	Amp. hrs.	360	360
Assumed Life of Plant	Yrs.	15	20
Assumed Life of Battery	Yrs.	7	7
Cost of Unit	$	431	374
Cost of Battery	$	265	255
Interest	%	3½	3½
Depreciation, Sinking Fund Basis	%	3	3
Generating Plant			
Depreciation	$	23.19	13.84
Interest	$	15.75	13.09
Repairs	$	8.62	3.75
Insurance	$	2.15	2.80
Fuel	$	70.00	-----
Oil	$	5.00	----
Battery			
Depreciation	$	34.58	33.28
Interest	$	9.28	8.93
Insurance	$	1.32	1.27
Total Annual Cost	$	169.89	76.97
Cost per kwhr			
1,000 kwhr	¢	17	7.7
500 kwhr	¢	--	15.4

The evidence suggests that only in the case of wind-charged plants with an output of 1,000 kwhr would the cost per kwhr approach the cost at which central station power could be provided, even at the lower average consumption which might be expected over any large number of farms.

If construction of farm distribution lines was being undertaken in areas in which farmers were already equipped with individual plants, it would be desirable to have these farms connected, but the existence of a plant already on the farm might present difficulties. The problem could be reduced by effective organization of the market for used plants.

There are certain areas of the Province in which, because of natural conditions and low density of farms, serving farms with central electric power does not appear to be practicable. This would seem to apply to a very large part of the portion of the Province east and south of the existing transmission lines. However, many farmers in this area could with advantage use individual plants. These farmers might provide the necessary demand for plants displaced in areas in which farm distribution lines were being erected. On the other hand it would be unwise to encourage the disposal of such plants in areas which might, in a short period of years, be served with central station power.

The individual plant appears to have a useful contribution to make, particularly in areas of low density of farms. In such areas, however, improved facilities might be possible through re-location of farmsteads in such a way as to bring them closer together. Re-location of farmsteads would present some acute difficulties; but in many situations advantages which could be demonstrated would result.

Summary.--(1) Additional costs which would be incurred by individual farmers would include the cost of wiring buildings, and of purchasing appliances. It is estimated that, to secure adequate average consumption, the average cost of wiring would be at least $150 per farm, and the average cost of appliances $300 per farm. It would be desirable to canvass all possible means, for example through standardization, of reducing these costs.

(2) The costs of wiring and appliances and the monthly bill for service do not represent net additional expenditures on the part of farmers. More information than is available is needed before any reliable estimate of net costs could be provided to individual farmers.

(3) The number of non-farm domestic users might, over an extensive farm scheme, represent about 16 per cent. of the number of farms connected. Some additional non-farm users would be connected.

(4) Landlord-tenant arrangements on rented farms would present a special problem.

(5) Some measure of user responsibility for and participation in the development and operation of farm distribution lines would appear desirable.

(6) The problem of arrears, disconnections, and bad debts might prove peculiarly troublesome in connection with the operation of farm distribution systems.

(7) An effective programme of education and promotion would be an essential prerequisite to successful operation of farm distribution systems.

(8) Individual farm plants have a useful contribution to make, particularly in areas of low density of farms; but, because of somewhat higher costs per unit of output or more restricted service, it would seem inadvisable to encourage the installation of individual plants in any area which might shortly be served with central station power.

(9) The number of connections and the degree of saturation in any area could probably be increased by effective organization of the market for used equipment displaced by the shift-over to electric power.

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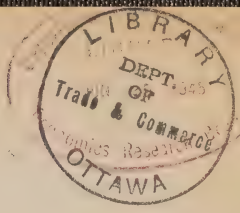

RURAL ELECTRIFICATION IN ALBERTA

APPENDIX 1

RURAL ELECTRIFICATION IN ALBERTA

APPENDIX I

GENERAL FEATURES OF THE SIXTEEN DISTRICTS IN THE POTENTIAL SERVICE AREA

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APPENDIX I

GENERAL FEATURES OF THE 16 DISTRICTS IN THE POTENTIAL SERVICE AREA (1)

As indicated in the text of the report on "Rural Electrification in Alberta" the defined potential service area was divided into 16 districts within which conditions generally were relatively uniform, and between which significant differences were apparent.

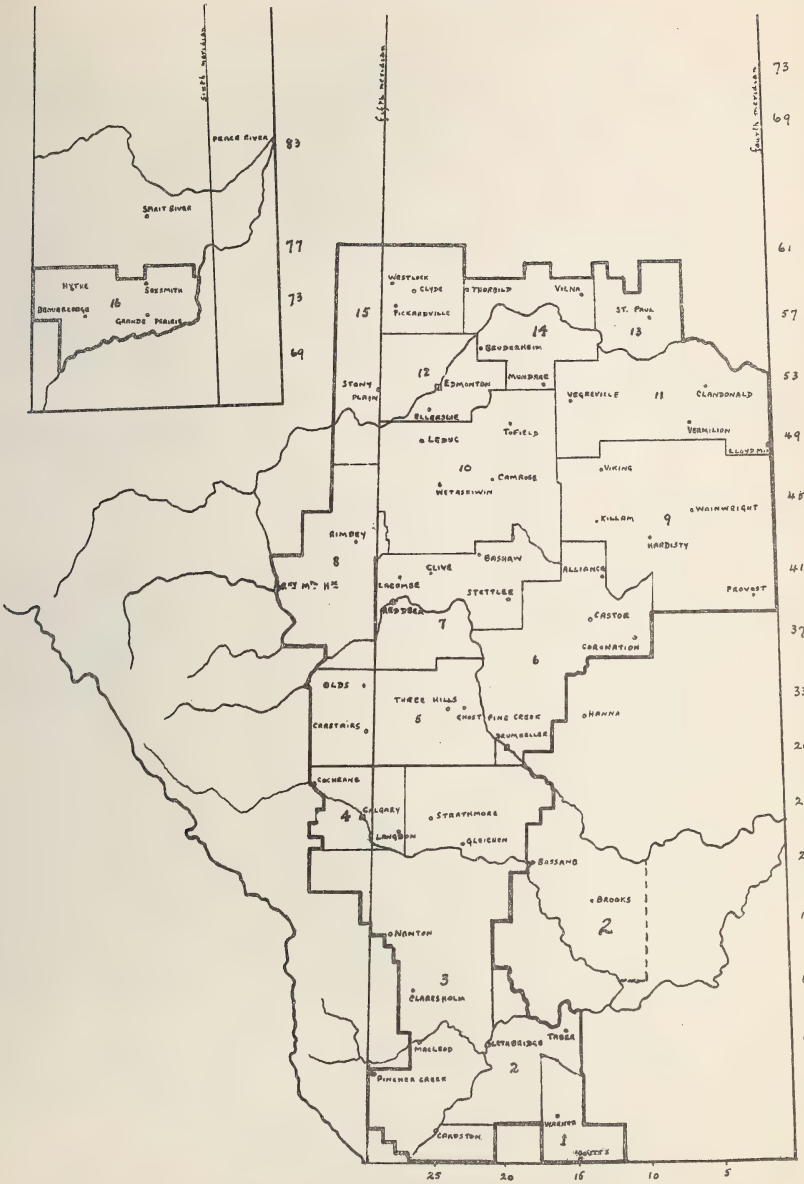
Some characteristics of these districts can be described from Census data; and the relevant data in Census reports were extracted and summarized. Additional material was obtained from surveys of sample areas in each of the districts, with the exception of District 1. The information from these two sources is brought together in this Appendix.

The location of each district is shown in the accompanying map (Figure 1). The municipal and improvement districts included in each of the largest districts defined for this study are shown in the tabulation of census data under each district. The 16 districts, and the locations of the sample areas in each district, are as follows:

(1) Mr. A. R. Brown, B.A., collaborated in the preparation of this Appendix. Surveys in the sample areas were conducted by Calgary Power Company, Canadian Utilities Limited, Economics Division, Dominion Department of Agriculture, and the Research Council of Alberta.

Figure I

DISTRICTS IN THE POTENTIAL SERVICE AREA



DISTRICT		SAMPLE AREA	
No.	Description	Legal Description	Nearest Town
1.	Warner - Coutts		
2.	Irrigated Districts	Tp.20;Rge.4;W. of 4th M.	Brooks
3.	Drumheller-Cardston	Tp.12;Rge.25;W.of 4th M.	Claresholm
4.	Calgary	Tp.23;Rge.27;W. of 4th M.	Langdon
5.	Olds-Carstairs	Tp.32;Rge.1;W. of 5th M.	Olds
		Tp.31;Rge.24;W. of 4th M.	Three Hills
6.	Drumheller-Castor	Tp.38;Rge.13;W. of 4th M.	Castor
7.	Red Deer	Tp.40;Rge.25;W. of 4th M.	Clive
		Tp.39;Rge.19;W. of 4th M.	Stettler
8.	West Fringe	Tp.43;Rge.2;W. of 5th M.	Rimbey
9.	Wainwright	Tp.44;Rge.14;W. of 4th M.	Killam
10.	Wetaskiwin	Tp.47;Rge.19;W. of 4th M.	Camrose
11.	Vegreville	Tp.52;Rge.6;W. of 4th M.	Clandonald
		Tp.50;Rge.6;W. of 4th M.	Vermilion
12.	Edmonton	Tp.51;Rge.24;W. of 4th M.	Ellerslie
13.	Nth.-East Fringe	Tp.59;Rge.8;W. of 4th M.	St. Paul
14.	Smoky Lake-Mundare	Tp.53;Rge.15;W. of 4th M.	Mundare
15.	Nth.-West Fringe	Tp.58;Rge.2;W. of 5th M.	Pickardville
16.	Grande Prairie	Tp.71;Rge.8;W. of 6th M.	Grande Prairie

In this appendix each district is described briefly in terms of the following features;

(1) Physical features
(2) Type of farming
(3) Population
(4) Size of farm
(5) Percentage of Tenant Farmers
(6) Value of farm property
(7) Representativeness of the Sample

Summary taken based on, first, the sample survey, and second, the Census reports follow the descriptive material for each district.

The Census tabulations are, it may be assumed, on a comparative basis, and provide a reasonably accurate description of the general conditions at the time the Census enumerations were made. Some material from the 1941 Census was not published at the time this Appendix was prepared, consequently, data from the 1936 Census has been used when information based on the later census would clearly have been preferable. Even when 1941 Census data have been used, allowance must be made for such changes as have occurred since that year.

As the Sample Areas were surveyed in 1943 the information from them could not, at best, be wholly comparable to the data from earlier census years. However, the data from the Sample Areas reveal defects which are attributable to other factors. In large part these defects are due to the fact that the surveys were conducted by different agencies, using somewhat different forms, and interpreting particular questions in somewhat different ways. For example, the tabulations for some Sample Areas are more complete than others; and the interpretation of acres worked was not uniform. While proof is lacking it is also possible that lack of uniformity affects the ratings given farms in different areas.

The object of the survey of Sample Areas was to secure descriptive material which would be representative of the district in which the Sample Area was located. At the conclusion of each section in this Appendix reference is made to the apparent representativeness of the sample. It is clear that the degree or representativeness varies. In some cases the data for the Sample Area compare closely

with the census data for the District. In other cases there is noticeable divergence. Where differences between the sample data and the district data appear significant, the conclusion may be that, from the point of view of farm electrification, the Sample Area is either better or poorer than the average for the district as a whole. This limits the validity of generalizing from the sample to the district.

While not all Sample Areas could be considered representative of the districts they are located in, some are better and some poorer. This means that where the sample data are used to reach conclusions for the whole service area some compensation occurs. This would be true for example in using the ratings of farms based on the samples. In some districts this would tend to over-estimate the probable connections; in other cases to under estimate the proportion of farmers who might take power. To the extent that these errors are compensating the estimated saturation for the whole service area may be more accurate than the estimate for any single district.

The data presented in this Appendix have already served a useful purpose in connection with the preparation of the report on "Farm Electrification in Alberta". If at any time a programme of farm electrification were undertaken, it is felt that the description they provide of conditions in different farming areas of the Province would prove useful to persons connected with the administration or supervision of such a programme.

DISTRICT I - WARNER - COUTTS

(1) Physical Features.

District No. I is a small area on the southern boundary. It is in the brown and dark brown soil zones of the prairie. Most of the land is level and bare with occasional variations. The grass cover is typical of the semi-arid regions; consequently a high acreage per animal is required for pasture.

(2) Type of Farming.

The area has two special types of farming; wheat growing and ranching. One of the largest ranches in Alberta is within the area, also a number of sheep are raised on the short prairie grass. Drought and insects are the two chief drawbacks, especially the former.

(3) Population.

About one-third of the population is of British races, the rest are mainly of Scandinavian and German stock. The population decreased from 1936 to 1941 and may decrease more; however, the number of farms increased which may alter the situation if the hazards of nature do not make it too difficult to secure a reasonable return for productive effort.

(4) Size of Farm.

Of all the districts selected for study, No. I heads the list as to size of farms. This is partly due to the following; first, the area chosen is small; secondly, the inclusion of large ranches greatly influences the average size, also it is a wheat farming area. The average number of farms per township is about 26-- less than one per square mile--with an average of three quarter sections improved land per farm.

(5) Percentage of Tenant Farmers.

The percentage tenancy is low, partly because the area is not wholly wheat growing but includes as well cattle and sheep ranches in which at least part of the land is owned.

District I ranks first in value of total property per farm. Large wheat farms and ranches account for this situation; and a fair proportion of this value is farm machinery. The value of farm buildings indicates a substantial investment--an advantage from an electrification point of view.

(7) Representativeness of the Sample.

No township data were secured in this district. The information available is to be found in the Census and in Dominion Government reports on areas in Southern Alberta.

Present knowledge points to a reasonably good picture from the standpoint of the farm and its ability to support power. The greatest drawback is the distance between farms, which is no doubt too great to justify the extension of electrification to a large proportion of the farms.

DISTRICT I - WARNER - COUTTS

Data from 1936 and 1941 Census Reports.

Total Rural Population (1936)	3,702
Total Rural Population (1941)	3,479
Decrease of Population (1936-41)	223
Farm Population (1936)	2,853
Non-Farm Population (1936)	849
Proportion of Non-Farm Population (1936)	30%
Total Acres in District	702,427
Acres per Rural Person (1936)	190
Acres per Rural Person (1941)	202
Acres per Farm Person (1936)	246
Acres per Non-Farm Person (1936)	827
Number of Farms (1936)	682
Number of Farms (1941)	770
Increase in Number of Farms (1936-1941)	88
Average Size of Farm - Total Acres (1936)	898
Average Size of Farm - Improved Acres (1936)	461
Total Acres in District per Farm (1941)	912
Percentage of Tenant Farmers	14%
Value of Farm Property - Total (1936)	$15,273
Value of Farm Property - Buildings (1936)	$ 1,895
Percentage population of Br. Races	37%
M.D's. & I.D's. Included in the District	5, 6, 36

DISTRICT II - IRRIGATED DISTRICTS

(1) Physical Features.

The irrigated districts are situated mainly in the semi-arid plains of the province. The soil changes from brown on the eastern side to dark brown on the western fringe, the greater part being within the brown soil zone. The topography for the greater part is level to undulating; the rolling sections are limited and mostly confined to grazing. The native cover is typical of the short grass zones of the great plains.

(2) Type of Farming.

At present four types of farming predominate in the irrigated districts; specialty crops, grain type, live stock and mixed farming. Some of these types have developed as a result of accessibility to markets, such as the specialty crop in the more southerly districts adjacent to sugar factories. The grain type has prevailed in the more northerly parts, while scattered throughout the area are the live stock and mixed farming types. The proximity of grazing areas to the irrigated districts combined with the high production of feed on irrigated land has resulted in the development of a limited live stock feeding enterprise.

Irrigation removes the fear and possibility of drought; however, grasshoppers and beet web-worms cause some damage, but in the main are kept under control.

(3) Population.

Since the forming of the irrigation districts both the rural and the urban populations have increased. Probably the chief reason for the increase has been the change over from large grain farms to smaller more intensified farming. Increase may be expected to continue as long as there is an outlet for specialized products. The

population is made up of many nationalities, the greater portion being British, Scandinavian and German.

(4) Size of Farm.

Size of farm varies widely; in the north where specialization is less developed the average size of farm is probably about one half a section, whereas in the more specialized parts of the south the average size will likely be one quarter section or less. Farms on the edge of irrigation will likely be larger as they will include grazing and dry land. This may be the reason for the variation in the district and sample data.

(5) Percentage Tenant Farmers.

There is a definite relationship between type of farming and tenancy. The higher tenancy occurs in the wheat farming areas and decreases with the smaller more specialized farms. As irrigation has developed there has been a change from wheat farming; this has had an effect on tenancy. Probably the district data for tenancy is somewhat out of line and the sample indicates more the actual situation in irrigated areas. Some purchase of land for investment may also affect the percentage tenant farmers.

(6) Value of Farm Property.

The value of buildings varies considerably with the district. The average value of buildings in the Canada Land area is $700, whereas for beet farms it is over $1,300. Not all buildings would be worth putting power in; this is indicated by the sample.

(7) Representativeness of the Sample.

The irrigated areas present the most variable districts of all those selected. In one part the emphasis may be on beets and live stock, in another grain or mixed farming. The situation around

Brooks is not the same as at Taber, therefore, it is difficult to make the sample apply to all. The district summary and the sample data give some guidance; nevertheless when a proposed electrification scheme is being planned a fuller understanding of the varying situations will be necessary. The District data, it will be observed, do not cover the Eastern Irrigation District; as the sample data were secured from the vicinity of Brooks.

FARM ELECTRIFICATION SURVEY

Tp. 20 Rge. 14 W. of 4 Meridian. Tp. Near BROOKS

Good Prospects 39 Per Cent. Good 28%

Fair Prospects 37 Per Cent. Fair 27%

Poor Prospects 63 Per Cent. Poor 45%

Owner Farms 110 Per Cent. Owned 79%

Tenant Farms 29 Per Cent. Tenant 21%

Total Farm Pop. 523 Average Farm Pop. 3.8

Average No. Acres per Farm 263 Worked per Farm 198

Proportion of Land Improved 75%

Total Cattle 3282 Average 26 Total Horses -- Average--

Total Hogs 6921 Average 49 Total Chickens -- Average --

Proportion of Farms with wells 4.3% Average Depth 85ft.

Power for Pumping 2 Percentage 1%

Grain Chopped per Farm 2662 Bu. Chopped by own tractor79%

Other means on Farm 1% Off the Farm 20%

Proportion Having Cars 60% Tractors 74% Telephones 10%

Type) Frame 143 Stucco 0 Other 0
of)
House) Percentage 100 Percentage 0 Percentage 0

Rooms per House 4.7

Condition of House: Good 26 % Fair 28 % Poor 46 %

Condition of Barn: Good 26 % Fair 26 % Poor 48 %

Area per Barn 840 Sq. Ft. Other Buildings per Farm 3.7

Distance House to Barn 193 ft. To Water 82 ft.

DISTRICT II - IRRIGATED DISTRICTS

Data From 1936 and 1941 Census Reports.

Total Rural Population (1936)	12,694
Total Rural Population (1941)	13,618
Increase of Population (1936 - 1941)	924
Farm Population (1936)	10,990
Non-Farm Population (1936)	1,704
Proportion of Non-Farm Pop. (1936)	16%
Total Acres in District	895,164
Acres per Rural Person (1936)	71
Acres per Rural Person (1941)	66
Acres per Farm Person (1936)	81
Acres Per non-Farm Person (1936)	525
Number of Farms (1936)	2,262
Number of Farms (1941)	2,350
Increase in Number of Farms (1936-1941)	88
Average Size of Farm - Total Acres (1936)	392
Average Size of Farm - Improved Acres (1936)	284
Total Acres in District per Farm (1941)	381
Percentage of Tenant Farmers	28%
Value of Farm Property - Total (1936)	$11,092
Value of Farm Property - Buildings (1936)	$ 1,520
% Population of British Races	56%
M.D.'s & I.D.'s included in the District	(x) 37, 38, 66, 67, 97.

(x) It is understood that there are approximately 1,200 farms on irrigated land in the Eastern Irrigation District. The above data do not cover this district.

DISTRICT III - DRUMHELLER - CARDSTON

(1) Physical Features.

The district lies within two soil zones--black and brown, with the greater portion in the latter. Of all the districts outlined for study this one is the largest. From the boundary near Cardston it extends north to Drumheller, west to the foothills and east past Vulcan. All variations in topography are to be found, from rolling foothills on the west to level prairie. Two or three rivers cut across the area breaking the monotony of many miles of prairie. Very little bush cover is found except on the western side.

(2) Type of Farming.

According to the 1936 Census of the Prairie Provinces the area is classified as wheat farming. Some parts of the district are more specialized than others. In the black soils wheat areas the percentage of specialized wheat farms is less and diversification is greater. A fair proportion is in natural cover which is used to pasture sheep and cattle. Precipitation is not always adequate; besides insect pests and soil drifting add to the hazards of farming.

(3) Population.

The district data reveal a decrease in both population and the number of farms, but the proportion is not great. Of the population, 57% are of British origin; the rest are mainly Scandinavian, German, Dutch and Russian.

(4) Size of Farm.

As a general rule farms in the area are large with the trend to even greater acreages. The proportion of rented land is high and farmers can often easily expand by renting available land near

their own farm. The average distribution of farmsteads is just under one per square mile, and this density of farms is not favorable to electrification.

(5) Percentage Tenant Farmers.

According to the 1936 Census showing farm classification there is a smaller proportion of owners in the wheat class than any other type of farming. The district data substantiates this statement; it shows a percentage tenancy of 30--the highest of all the districts.

(6) Value of Farm Property.

This area has the second highest property valuation per farm of all the districts. A fair proportion of this value will be machinery as the area has a high machinery valuation per farm. The value of buildings per farm ranks second among all the districts selected, with Calgary as first. This high average value of farm buildings is encouraging if only the farmsteads were closer together, thus cutting down the average cost of line per farm.

(7) Representativeness of the Sample.

District III covers a large area; therefore, the propability of variations of the sample with the district becomes greater. It is generally recognized the western side of the area is in a more favourable farming area; this is true of the Claresholm sample. Most items on the sample summary give a good farming picture--many proportions are high, likely higher than for the district as a whole. A measure of the district's productive ability based on the sample study may need several adjustments resulting in a less favourable picture.

FARM ELECTRIFICATION SURVEY.

Tp. 12 Rge. 25 W. of 4 Meridian. Tp. near CLARESHOLM .

Good Prospects 50 Per Cent. Good 49%

Fair Prospects 21 Per Cent. Fair 20%

Poor Prospects 32 Per Cent. Poor 31%

Owner Farms 58 Per Cent. Owned 56%

Tenant Farms 45 Per Cent. Tenant 44%

Total Farm Population 367 Average Farm Population 3.6

Average Number Acres per Farm 514 Worked Per Farm 509 (x)

Proportion of Land Improved 99%

Total Cattle 983 Average 9.5 Total Horses --- Average ---

Total Hogs 3615 Average 35.1 Total Chickens -- Average ---

Proportion of Farms with Wells 98% Average Depth 116 ft.

Power for Pumping 67 Percentage 65%

Grain Chopped per Farm 1039 Bu. Chopped by own Tractor 64%

Other means on Farm 0% Off the Farm 36%

Proportion Having: Cars 88% Tractors 91% Telephones 79%

Type of House) Frame 103 Stucco 4 Other ---
) Percentage 96 Percentage 4 Percentage --

Rooms per House 6.1

Condition of House: Good 50 % Fair 22 % Poor 28 %

Condition of Barn: Good 47 % Fair 26 % Poor 27 %

Area per Barn 1584 Sq Ft. Other Buildings per Farm 5.4

Distance House to Barn 178 ft. To Water 90 ft.

(x) Acres worked per farm includes all land that can be cultivated.

DISTRICT III - DRUMHELLER - CARDSTON

Data From the 1936 & 1941 Census Report.

Total Rural Population (1936)	36,056
Total Rural Population (1941)	34,644
Decrease of Population (1936-1941)	1,412
Farm Population (1936)	31,085
Non-Farm Population (1936)	4,971
Proportion of Non-Farm pop. (1936)	16%
Total Acres in District	4,378,020
Acres per Rural Person (1936)	121
Acres per Rural Person (1941)	126
Acres per Farm Person (1936)	141
Acres per Non-Farm Person (1936)	881
Number of Farms (1936)	7,678
Number of Farms (1941)	7,399
Decrease in Number of Farms (1936-1941)	279
Average Size of Farm - Total Acres (1936)	541
Average Size of Farm - Improved Acres (1936)	374
Total Acres in District per Farm (1941)	592
Percentage of Tenant Farmers	30%
Value of Farm Property - Total (1936)	$12,220
Value of Farm Property - Buildings (1936)	$ 1,917
% Population of British Races	57%

M.D.'s & I.D.'s Included in the District 8, 9, 10, 39, 68, 69, 98, 99, 128, 129, 157, **159, 189, 190, 191, 217, 218,** 219, 247, 248-9.

DISTRICT IV - CALGARY

(1) Physical Features.

Although a part of the district is in the black soil zone, the greater portion lies within the shallow black. The eastern half of the area is typical of the prairie, level to gently rolling. The western half has a varying topography from level to hilly, with valleys and coulees here and there. Considerably more bush cover is found on the western half, besides there is a variation in grass cover towards the west.

(2) Type of Farming.

Different types of farming are to be found in the Calgary district. To the east conditions are more typical of the prairie and wheat farming is prominent. Around Calgary and to the west considerable emphasis is on hogs and dairy. No definite statement regarding the position of each type of farming can be made, instead the general picture is expressed. Calgary district occasionally suffers from drought but not to the same extent as areas farther east.

(3) Population.

The Calgary area is one of the oldest in the province and shows now almost three quarters of the population of British races. The population has increased slightly; however, this may be due to the war and the increase in the prices of farm products that are produced relatively close to an increasing market.

(4) Size of Farm.

As previously pointed out wheat farming is more typical of the eastern portion of the district. The two summary tables bear

this out. The sample was taken around Langdon, east of Calgary, and the average size of farm is 100 acres more than for the area as a whole.

(5) Percentage of Tenant Farmers.

The city of Calgary is situated within the area and naturally around this centre will be hog ranching and dairy farming. From observation of all the districts with farming of this type, the percentage tenancy is low. This is the general situation around Calgary. It is to be noted the sample has a much higher tenancy than for the district due to more wheat farming.

(6) Value of Farm Property.

Calgary district stands first in average value of buildings and third for value of total farm property. If the value of buildings is a criterion of their worth for installing power, then most buildings in the Calgary district should be in a favoured position. The sample data does not substantiate this too strongly.

(7) Representativeness of the Sample.

After reference to both summary tables there is evidence of variation, e.g., in size of farm, and tenancy. It has been suggested the sample township reflects more wheat farming. The variation is not important, however, if all types of farming are prosperous; on the other hand the average distance farms are apart is important. On the whole District No.IV presents an encouraging picture.

FARM ELECTRIFICATION SURVEY

Tp. 23 Rge. 27 W. of 4 Meridan. Tp. near LANGDON

Good Prospects 17 Per Cent. Good 32%

Fair Prospects 8 Per Cent. Fair 15%

Poor Prospects 27 Per Cent. Poor 53%

Owner Farms 35 Per Cent. Owned 67%

Tenant Farms 17 Per Cent. Tenant 33%

Total Farm Population 159 Average Farm Population 3.06

Average Number Acres per Farm 511 Worked per Farm 511 (x)

Proportion of Land Improved 100%

Total Cattle 893 Average 17.2 Total Horses --- Average---

Total Hogs 2232 Average 42.9 Total Chickens--- Average---

Proportion of Farms with Wells 96% Average Depth 85 ft.

Power for Pumping 38 Percentage 73%

Grain Chopped per Farm 1,952 Bu. Chopped by own Tractor 87%

Other means On Farm 0% Off the Farm 13%

Proportion Farms Having: Cars 79% Tractors 87% Telephones 52%

Type of House) Frame 49 Stucco 3 Other ---

Percentage 94 Percentage 6 Percentage ---

Rooms per House 6.8

Condition of House: Good 42 % Fair 17 % Poor 41 %

Condition of Barn: Good 32 % Fair 32 % Poor 36 %

Area per Barn 1,374 Sq. Ft. Other Buildings per Farm 4.6

Distance House to Barn 167 ft. To Water 70 ft.

(x) Acres worked per farm includes all land that can be cultivated.

DISTRICT IV - CALGARY

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	8,327
Total Rural Population (1941)	8,828
Increase of Population (1936 - 1941)	501
Farm Population (1936)	6,553
Non-Farm Population (1936)	1,774
Proportion of Non-Farm Pop. (1936)	27%
Total Acres in District	686,253
Acres per Rural Person (1936)	82
Acres per Rural Person (1941)	78
Acres per Farm Person (1936)	105
Acres per Non-Farm Person (1936)	387
Number of Farms (1936)	1,630
Number of Farms (1941)	1,581
Decrease in Number of Farms (1936-1941)	49
Average Size of Farm - Total Acres (1936)	403
Average Size of Farm - Improved Acres (1936)	232
Total Acres in District per Farm (1941)	434
Percentage of Tenant Farmers	20%
Value of Farm Property - Total (1936)	$11,614
Value of Farm Property - Buildings (1936)	$ 2,385
% Population of British Races	72%
M.D.'s & I.D.'s Included in the District	220-1 250-1

DISTRICT V - OLDS - CARSTAIRS

(1) Physical Features.

Three soil zones are found within the district; dark brown in the south-east corner, then shallow black in the centre and black on the west side. The topography is generally level to undulating; here and there it becomes slightly hilly with occasional valleys and coulees. The bush and grass cover on the eastern side is typical of the prairie, while the western part is representative of the parklands with poplar and willow bluffs.

(2) Type of Farming.

According to the 1936 Census, showing types of farming, the area is mostly wheat growing with some mixed farming including cattle and swine. The greatest emphasis on wheat is in the eastern half, while a number of well known purebred stock farms and ranches are to be found in the west. Such towns as Olds, Didsbury and Carstairs are well known as centres of a good farming area. The Agricultural School at Olds helps to stimulate and improve general farming practices. The sample study near Olds suggests a strong trend to live stock farming with an average of 27 cattle and 52 hogs per farm, whereas the sample at Three Hills is lower for hogs and considerably lower for cattle.

(3) Population.

The area is rather unique in that the population dropped over 1,000 and yet the number of farms increased. This drop in population has been mostly from the farm as the non-farm population is not large enough to account for this change. The war and a changing to live stock production because of better prices should explain in part the above. About one-half the population are of British origin, the rest are mainly of German, Dutch, and Scandinavian stock.

(4) Size of Farm.

Size of farm will vary from the wheat growing portion to the more mixed farming parts. It is to be expected the density of farmsteads will be greater in the western half of the area. Around Olds the average size of farm is just over one-half section, the average for the district as a whole, while for Three Hills it is larger.

(5) Percentage Tenant Farmers.

Twenty-one per cent. of the farmers in the district are renters, whereas, there are twenty-three per cent. in one sample survey and five per cent. in the other. If present farm prices continue it is quite probable the percentage will decrease. At least the number of farms is increasing slightly which is an encouraging sign.

(6) Value of Farm Property.

The area has enjoyed a fairly prosperous period in the past. There are many fine farm homes with large barns and a number of other buildings, also the land as a whole has a high acreage value. The sample study has a good proportion of the houses and barns rated "good" or "fair".

(7) Representativeness of the Sample.

In some respects the sample varies from the district as a whole, e.g., the number of live stock per farm will be greater than for the eastern part, as pointed out earlier. On the other hand the average size of farm, the percentage tenancy, and the general picture of the buildings seems to correspond fairly well. The sample should be quite representative of the western part; however, it may be somewhat optimistic for the area east of Three Hills even though the percentage "good" near Three Hills is quite favourable.

FARM ELECTRIFICATION SURVEY

Tp. 32 Rge. 1 W. of 5 Meridian. Tp. near OLDS

Good Prospects 52 Per Cent. Good 39%

Fair Prospects 30 Per Cent. Fair 22%

Poor Prospects 52 Per Cent. Poor 39%

Owner Farms 103 Per Cent. Owned 77%

Tenant Farms 31 Per Cent. Tenant 23%

Total Farm Population 518 Average Farm Population 3.9

Average Number Acres per Farm 413 Worked per Farm 401 (x)

Proportion of Land Improved 97%

Total Cattle 3620 Average 27 Total Horses ---- Average ----

Total Hogs 6945 Average 52 Total Chickens -- Average ----

Proportion of Farms with Wells 100% Average Depth 85 ft.

Power for Pumping 111 Percentage 83 %

Grain Chopped per Farm 3647 Bu. Chopped by Own Tractor 75%

Other means On Farm 3% Off Farm 32%

Proportion Having: Cars 89% Tractors 74% Telephones 38%

Type of House	) Frame 133	Stucco 6	Other 2
	) Percentage 94.3%	Percentage 4.3%	Percentage 1.4%

Rooms per House 5.6

Condition of House: Good 44 % Fair 25 % Poor 31 %

Condition of Barn: Good 34 % Fair 28 % Poor 38 %

Area per Barn 1368 Sq. Ft. Other Buildings per Farm 4.8

Distance House to Barn 178 ft. To Water 113 ft.

(x) Acres worked per farm includes all land that can be cultivated.

FARM ELECTRIFICATION SURVEY

Tp. 31 Rge. 24 W. of 4 Meridian Tp. Near THREE HILLS

Good Prospects 27 Per Cent. Good 64%

Fair Prospects 9 Per Cent. Fair 22%

Poor Prospects 6 Per Cent. Poor 14%

Owner Farms 40 Per Cent. Owned 95%

Tenant Farms 2 Per Cent. Tenant 5%

Total Farm Population 147 Average Farm Population 3.9

Average Number Acres per Farm 514 Worked per Farm 442

Proportion of Land Improved 86%

Total Cattle 672 Average 16 Total Horses 160 Average 3.8

Total Hogs 1764 Average 42 Total Chickens 10,122 Average 241

Proportion of Farms with Wells 100% Average Depth 128 ft.

Power for Pumping 36 Percentage 86%

Grain Chopped per Farm 2,000 Bu. Chopped by own Tractor 55%

Other means on Farm 3% off Farm 42%

Cars & Trucks per Farm 1.26 Tractors per Farm 1.16 Telephones 24%

Type of House	) Frame (x)	Stucco	Other
	) Percentage	Percentage	Percentage

Rooms per House 6.4

Condition of House: Good % Fair % Poor %

Condition of Barn: Good % Fair % Poor %

Area per Barn 1260 Sq. ft. Other Buildings per Farm

Distance House to Barn 150 ft. To Water

(x) No data secured for some items.

DISTRICT V - OLDS - CARSTAIRS

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	18,969
Total Rural Population (1941)	17,897
Decrease of Population (1936-1941)	1,072
Farm Population (1936)	17,208
Non-Farm Population (1936)	1,761
Proportion of Non-Farm Pop. (1936)	10%
Total Acres in District	1,695,909
Acres per Rural Person (1936)	89
Acres per Rural Person (1941)	95
Acres per Farm Person (1936)	99
Acres per Non-Farm Person (1936)	963
Number of Farms (1936)	4,064
Number of Farms (1941)	4,077
Increase in Number of Farms (1936-1941)	13
Average Size of Farm - Total Acres (1936)	406
Average Size of Farm - Improved Acres (1936)	279
Total Acres in District per Farm (1941)	416
Percentage of Tenant Farmers	21%
Value of Farm Property - Total (1936)	$11,130
Value of Farm Property - Buildings (1936)	$ 1,811
% Population of British Races	51%
M.D.'s and I.D.'s Included in the District	278-281 308-311

DISTRICT VI - DRUMHELLER - CASTOR

(1) Physical Features.

Practically all of the district is within the dark brown soil zone. Parts of the area may be classified as semi-arid and at various times the district has suffered from a series of dry years. The topography is mostly level to gently rolling with occasional coulees and creek beds traversing certain areas. The native grass cover is of the short variety typically found on prairie regions; some trees, namely, poplar and willow grow in occasional bluffs.

(2) Type of Farming.

In the past this area has been a wheat growing country, now the emphasis is swinging to mixed farming. Present market prices for live stock and quotas on grain have resulted in a marked increase in the number of live stock. Cattle are raised, particularly on the open grazing land. The township sample shows an average of 26 head per farm, this is the highest average shown for any of the northern samples. Dry years have lessened considerably the amount of land under cultivation and fields that were once cropped are now returning to grass to pasture cattle.

(3) Population.

A drop in population of about 1/13 took place between 1936-41. Since more emphasis has been on mixed farming in the last few years this decrease may have stopped. The average farm population for the district as a whole is lower than for the sample study.

(4) Size of Farm.

The average size of farm is over 3 quarter sections, this means farms are quite far apart. The abondonment of some farms and the returning to grass of once arable land will make it possible for

more cattle to be raised. If this becomes the situation then farmsteads will be even less dense throughout the area.

(5) Percentage Tenant Farmers.

Twenty-five per cent. of the farmers are renters. The sample survey indicates even more. It is expected that the proportion will be relatively high as past drought years in the area would tend to encourage renting rather than investing in farm land. Immediate future prospects for a lower proportion of tenancy are not very promising.

(6) Value of Farm Property.

Throughout the area there are a number of abondoned homes. The occupied farmsteads for the most part suffer from a lack of paint; however, there are a few good farmsteads with large, well-built homes. On the whole the buildings cannot be classified as good. The average value of farm property is over $8,000 but it is important to remember that the average size of farm is large.

(7) Representativeness of the Sample.

Variations in density of farms exists throughout the area. A fair density exists in an area around Delia, then it thins out all along the south and east of the district. Very few townships show a well settled farm population. The sample survey only included 31 farms. The number of acres per farm and the number of acres worked per farm as shown by the sample correspond closely enough with the district data. For the greater part of the area the sample study seems to reflect the situation in most of the districts. The condition of the farm buildings and especially the sparse population presents barriers to the extension of central station power.

FARM ELECTRIFICATION SURVEY

Tp. 38 Rge. 13 W. of 4 Meridian. Tp. Near CASTOR

Good Prospects 13 Per Cent. Good 41%

Fair Prospects 6 Per Cent. Fair 18%

Poor Prospects 13 Per Cent. Poor 41%

Owner Farms 21 Per Cent. Owned 68%

Tenant Farms 10 Per Cent. Tenant 32%

Total Farm Population 156 Average Farm Population 5

Average Number Acres per Farm 546 Worked per Farm 288

Proportion of Land Improved 53%

Total Cattle 795 Average 25.6 Total Horses 274 Average 8.8

Total Hogs 943 Average 30.4 Total Chickens 3110 Average 100.3

Proportion of Farms with Wells 77% Average Depth 59 ft.

Power for Pumping 5 Percentage 16 %

Grain Chopped per Farm 853 Bu. Chopped by own Tractor 29%

Other Means on Farm 6% off the Farm 65%

Proportion having: Cars 77% Tractors 52% Telephones 29%

Type of House	Frame	Stucco	Other
	29	2	-------
Percentage	93.5	6.5	----

Rooms per House 5.1

Condition of House: Good 29 % Fair 45 % Poor 26 %

Condition of Barn : Good 30 % Fair 30 % Poor 40 %

Area per Barn 1066 Sq. Ft. Other Buildings per Farm 5.2

Distance House to Barn 239 ft. To Water 200 ft.

DISTRICT VI - CASTOR - DRUMHELLER

Data From 1936 & 1941 Census Reports

Total Rural Population (1936)	13,753
Total Rural Population (1941)	12,762
Decrease of Population (1936-1941)	991
Farm Population (1936)	12,787
Non-Farm Population (1936)	966
Proportion of Non-Farm Pop. (1936)	8%
Total Acres in District	1,910,381
Acres per Rural Person (1936)	139
Acres per Rural Person (1941)	150
Acres per Farm Person (1936)	149
Acres per Non-Farm Person (1936)	1,978
Number of Farms (1936)	3,568
Number of Farms (1941)	3,388
Decrease in Number of Farms (1936-1941)	180
Average Size of Farm - Total Acres (1936)	499
Average Size of Farm - Improved Acres (1936)	275
Total Acres in District per Farm (1941)	564
Percentage of Tenant Farmers	25%
Value of Farm Property - Total (1936)	$8,140
Value of Farm Property - Buildings (1936)	$1,355
% Population of British Races	58%
M.D.'s & I.D.'s Included in the District	277, 306-7, 334, 336-7, 365-6, 395.

DISTRICT - VII - RED DEER

(1) Physical Features.

The soil in the main is heavy black loam of good weight and depth; only the south-east portion of the district lies in the shallow black soil area. The topography of certain portions is rolling to hilly, whereas other parts may be described as undulating to gently rolling. The bush cover is typically parkland and in the main the native grass is abundant for hay or pasture.

(2) Type of Farm.

Red Deer is another district typical of mixed farming. Considerable emphasis is placed on milk production and hog raising. Red Deer is the centre of a large canned milk factory. A large proportion of the improved land produces coarse grains and hay, with wheat production playing a less important role.

(3) Population.

According to the census data the district suffered a slight decrease in population and a more than proportional decrease in the number of farms. However, the decrease in population is too small to make any significant conclusions and it may be reversed next census. Red Deer is one of the oldest established districts in the province, with 68% of the population being British. It is to be expected it will remain fairly steady in total farm people.

(4) Size of Farm.

Slightly over a half section is the average size of farm, with about half under cultivation. The average for the district would be about 2 farmers per square mile. Certain parts, e.g., around Red Deer will be above the average density, whereas eastern parts, e.g., around Nevis will be less densely populated.

(5) Percentage Tenant Farmers.

The percentage tenant farmers is relatively high for this district. Both the district data and the sample survey agree on this high proportion. Considerable land in the area is owned by mortgage companies and this would account in part for the above. The future interest in farm electrification by absentee landlords, is as yet an undertermined factor.

(6) Value of Farm Property.

The average total farm property in the district is $7,532, buildings $1,376. As the average size of farm is 342 acres this would give approximately $7,000 per half section.

(7) Representativeness of the Sample.

Two township surveys have been made within the district, one near Clive the other near Stettler. For the district as a whole the sample at Clive may give a somewhat optimistic picture. The opposite might be true of the Stettler study. Probably an estimate between the two would give the best approximation. In any case, if power is to be extended to any part of the Province the prospects in the Red Deer district would appear to be encouraging.

FARM ELECTRIFICATION SURVEY

Tp. 40 Rge. 25 W. of 4 Meridian. Tp. Near CLIVE

Good Prospects 52 Per Cent. Good 74%

Fair Prospects 13 Per Cent. Fair 19%

Poor Prospects 5 Per Cent. Poor 7%

Owner Farms 49 Per Cent Owned 72%

Tenant Farms 19 Per Cent. Tenant 28%

Total Farm Population 256 Average Farm Population 3.8%

Average Number Acres per Farm 313.6 Worked per Farm 216.5

Proportion of Land Improved 69%

Total Cattle 1002 Average 14.9 Total Horses 464 Average 6.8

Total Hogs 3808 Average 56 Total Chickens 7869 Average 116

Proportion of Farms with Wells 95.6 Average Depth 88 ft.

Power for Pumping 43 Percentage 63

Grain Chopped per Farm 2270 Bu. Chopped by own Tractor 60%

Other means On Farm 6% Off Farm 34%

Proportion Having: Cars 88% Tractors 68% Telephones 54%

Type of House) Frame 64 Stucco 1 Other 8

Percentage 87.7 Percentage 1.4 Percentage 10.9

Rooms per House 5.3

Condition of Houses: Good 58.6 % Fair 27.2 % Poor 14.2 %

Condition of Barn : Good 52.9 % Fair 25.7 % Poor 21.4 %

Area per Barn 989 Sq. Ft. Other Buildings per Farm 2

Distance House to Barn 198 ft. To Water 183 ft.

FARM ELECTRIFICATION SURVEY

Tp. 39 Rge. 19 W. of 4 Meridian. Tp. Near STETTLER

Good Prospects 15 Per Cent. Good 33%

Fair Prospects 11 Per Cent. Fair 24%

Poor Prospects 20 Per Cent Poor 43%

Owner Farms 42 Per Cent Owned 91%

Tenant Farms 4 Per Cent. Tenant 9%

Total Farm Population 121 Average Farm Population 5.5

Average Number Acres per Farm 645 Worked per Farm 412

Proportion of Land Improved 64%

Total Cattle 1840 Average 40 Total Horses 373 Average 8.1

Total Hogs 3864 Average 84 Total Chickens 6486 Average 141

Proportion of Farms with Wells 91% Average Depth 120 ft.

Power for Pumping 19 Percentage 86%

Grain Chopped per Farm 4300 Bu. Chopped by own Tractor 45%

Other means On Farm 14% Off Farm 41%

Cars & Trucks Per Farm 1.14 Tractors Per Farm .86 Telephones 45%

Type of House) Frame (x) Stucco Other
) Percentage Percentage Percentage

Rooms per House 6.2

Condition of House: Good % Fair % Poor %

Condition of Barn : Good % Fair % Poor %

Area per Barn 1500 Sq. Ft. Other Buildings per Farm

Distance House to Barn 143 ft. To Water

(x) No data secured for some items.

DISTRICT VII - RED DEER

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	19,618
Total Rural Population (1941)	19,495
Decrease of Population (1936-1941)	123
Farm Population (1936)	18,011
Non-Farm Population (1936)	1,607
Proportion of Non-Farm Pop. (1936)	9%
Total Acres in District	1,650,989
Acres per Rural Person (1936)	84
Acres per Rural Person (1941)	85
Acres per Farm Person (1936)	92
Acres per Non-Farm Person (1936)	1,027
Number of Farms (1936)	4,616
Number of Farms (1941)	4,494
Decrease in Number of Farms (1936-1941)	122
Average Size of Farm - Total Acres (1936)	342
Average Size of Farm - Improved Acres (1936)	161
Total Acres in District per Farm (1941)	367
Percentage of Tenant Farmers	23%
Value of Farm Property - Total (1936)	$7,532
Value of Farm Property - Buildings (1936)	$1,376
% Population of British Races	68%
M.D.'s & I.D.'S Included in the District	338-40, 367 396-9.

DISTRICT VIII - WEST FRINGE

(1) Physical Features.

The general topography may be described as gently rolling, although parts are rolling with several creeks and valleys. The area lies within two soil zones--the black and the transition or grey bush soil. The area is dotted with tree growth, mostly poplar and willow. Towards the west this growth increases as part of the area is in the bush region.

(2) Type of Farming.

Mixed farming is the chief occupation with special emphasis on cattle and hogs. Barley and oats are the chief grain crop, and these are mostly for feed. The district seldom suffers from drought and generally produces an abundance of hay and coarse grains. The township sample is quite indicative of a mixed farming area. The average for cattle and horses is quite high, while for hogs it is 72 per farm.

(3) Population.

Parts of the area have been settled for a long time, whereas other parts have just been recently opened up. The west part of the district is the frontier that is being pushed wider year by year. Thus it is to be expected there will be an increase in population as shown by the census. The increase of 213 farms is partly a result of the increase in population. Over fifty per cent. of the population are of British races; two other groups well represented are the Germans and Scandinavians.

(4) Size of Farm.

As it is to be expected the average size of farm is not large. Considerable bush has been a barrier to the improving of large acreages. The district data indicate an average of 3 farmsteads

per square mile. However, the sample study is not quite as encouraging, the table shows less than 2 farmsteads per section. The size of farm is representative of a mixed farming area. Probably the trend will be toward larger farms in the older, better parts of the district and for a time, smaller farms on the west edge near the bush.

(5) Percentage Tenant Farmers.

The percentage tenancy is low for the district. This situation is typical of all the three districts that comprise the fringe areas in the northern part of the Province. Although other barriers to electrification exist the owner-tenant problem is less acute than for other areas.

(6) Value of Property.

For the district as a whole the average value of property is not high. The average for buildings is less than $1,000, indicating that many are not worth installing power in. In some parts, however, buildings may be described as good, with frequent well-painted frame homes and stucco houses.

(7) Representativeness of the Sample.

There are two or three indications that the district and sample data are not in agreement. The average number of acres per farm and the average worked per farm for the sample are considerably more than for the district. The type of house and condition seem to show a better class of building than might be expected from an average of $964 for buildings. Good and fair prospects for electrification are almost 90%; this may be high for the district. A careful conclusion based on the information in the tables as to the representativeness of the sample is difficult. However, there is some evidence it may be on the optimistic side.

FARM ELECTRIFICATION SURVEY

Tp. 43 Rge. 2 W. of 5 Meridian. Tp. Near RIMBEY

Good Prospects 34 Per Cent. Good 64%

Fair Prospects 12 Per Cent. Fair 23%

Poor Prospects 7 Per Cent. Poor 13%

Owner Farms 45 Per Cent. Owned 85%

Tenant Farms 8 Per Cent. Tenant 15%

Total Farm Population 196 Average Farm Population 3.7

Average Number Acres per Farm 390 Worked per Farm 221.3

Proportion of Land Improved 57%

Total Cattle 1,146 Average 21.6 Total Horses 424 Average 8

Total Hogs. 3,817 Average 72 Total Chickens 5,153 Average 97.3

Proportion of Farms with Wells 94% Average Depth 87 ft.

Power for Pumping 35 Percentage 66%

Grain Chopped per Farm 2,643 Bu. Chopped by own Tractor 67%

Other means on Farm 12% off Farm 21%

Proportion Having: Cars 81% Tractors 66% Telephones 42%

Type of House) Frame 42 Stucco 5 Other 6
) Percentage 79.2 Percentage 9.4 Percentage 11.4

Rooms per House 4.8

Condition of House: Good 35.8 % Fair 43.4 % Poor 20.8%

Condition of Barn : Good 28 % Fair 20 % Poor 52 %

Area per Barn 1,037 Sq. Ft. Other Buildings per Farm 3.2

Distance House to Barn 192 ft. To Water 115 ft.

DISTRICT VIII - WEST FRINGE.

Data From 1936 & 1941 Census Reports.

Total Rural Population (1936)	18,189
Total Rural Population (1941)	19,345
Increase of Population (1936-1941)	1,156
Farm Population (1936)	16,418
Non-Farm Population (1936)	1,771
Proportion of Non-Farm Pop. (1936)	11%
Total Acres in District	1,519,078
Acres per Rural Person (1936)	84
Acres per Rural Person (1941)	79
Acres per Farm Person (1936)	93
Acres per Non-Farm Person (1936)	858
Number of Farms (1936)	4,274
Number of Farms (1941)	4,487
Increase in Number of Farms (1936-1941)	213
Average Size of Farm - Total Acres (1936)	266
Average Size of Farm - Improved Acres (1936)	119
Total Acres in District per Farm (1941)	339
Percentage of Tenant Farmers	13%
Value of Farm Property - Total (1936)	$5,236
Value of Farm Property - Buildings (1936)	$ 964
% Population of British Races	53%
M.D.'s & I. D.'s Included in the District	341-2, 371, 400-1, 430-1, 460.

DISTRICT IX - WAINWRIGHT.

(1) Physical Features.

For the most part the soil is a shallow black with some dark brown in the southern corner. The topography is level to gently rolling with occasional hills and coulees. Practically all of the district is within the parklands and includes Wainwright Park.

(2) Type of Farming.

Mixed farming, with considerable emphasis on wheat growing as the chief farming activity. On the average farms are fairly large with a good proportion being under cultivation. The type of farming carried on in certain parts of the district is in many ways quite similar to the farming in the soutehrn part of the Province, e.g., around Vulcan.

(3) Population.

The district data show a decrease in population and in the number of farms. The township survey shows an average farm population of 3.7; this is somewhat lower than the average for the district.

(4) Size of Farms.

Both the census data and the sample survey indicate large farms. This would mean that farmsteads are fairly far apart. A decrease in the population will likely result in still larger farms and fewer per township. This is a drawback from the point of view of electrification as farms are farther apart and hence the costs of construction will be greater.

(5) Percentage Tenant Farmers.

According to the district data the percentage tenant farmers is the same for Wainwright as it is for Wetaskiwin (19%). The proportion is not too large if in the future it does not increase; however, the sample studies in both districts are considerably more

(Wainwright 32%). There is some evidence to show that larger farms have a higher percentage tenancy. If this is the case then the Wainwright area will, under present conditions, tend to increase in number of tenant farmers--a prospect not favourable to electrification.

(6) Value of Farm Property.

The census indicate the average value of farm buildings to be $1,232. Certainly, indications show that most of the buildings are worth installing power in. The average value of farm property as a whole is $7,122. In the township studied 90% of the houses are of frame construction and on the whole 57% were rated good and 35% fair. Only about 50% of the barns were rated as in good condition. The homes as a general rule are large, the average number of rooms being 6.7. Most buildings in the township studied have been up a long time and some are in need of repair. This can be said for a fair proportion of the district as a whole.

(7) Representativeness of the Sample.

The number of acres per farm and the number of acres worked per farm are greater in the township studied than for the district as a whole. Other townships around the one studied are very similar. This is true of practically all the west end of the district. Farther east the picture is not always as encouraging. Census information of each township within the district shows some areas, especially in the eastern part, as being quite sparsely populated. The township studied is then really more representative of the western half of the district and it is quite probable that the exclusion of some more sparsely populated parts of the district would be necessary.

FARM ELECTRIFICATION SURVEY

Tp. 44 Rge. 14 W. of 4 Meridian. Tp. Near KILLAM

Good Prospects 24 Per Cent. Good 56%

Fair Prospects 14 Per Cent. Fair 33%

Poor Prospects 5 Per Cent. Poor 11%

Owner Farms 28 Per Cent. Owned 68%

Tenant Farms 13 Per Cent. Tenant 32%

Total Farm Pop. 153 Average Farm Pop. 3.7

Average No. Acres per Farm 499.5 Worked per Farm 328.9

Proportion of Land Improved 66%

Total Cattle 665 Average 16.2 Total Horses 346 Average 8.4

Total Hogs 1,212 Average 29.6 Total Chickens 6336 Average 154.5

Proportion of Farms with wells 100% Average Depth 92 ft.

Power for Pumping 35 Percentage 85%

Grain Chopped per Farm 1,282 Bu. Chopped by own Tractor 37%

Other means on Farm 8% off Farm 55%

Proportion Having: Cars 71 % Tractors 54 % Telephones 37 %

Type of House) Frame 38 Stucco ------ Other 4
Percentage 90.5 Percentage ----- Percentage 9.5

Rooms per House 6.7

Condition of House: Good 57.2 % Fair 35.7 % Poor 7.1 %

Condition of Barn : Good 51.2 % Fair 31.7 % Poor 17.1 %

Area per Barn 1,269 Sq. Ft. Other Buildings per Farm 2.2

Distance House to Barn 201 ft. To Water 114 ft.

DISTRICT IX - WAINWRIGHT

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	24,467
Total Rural Population (1941)	21,667
Decrease of Population (1936-1941)	2,800
Farm Population (1936)	22,730
Non-Farm Population (1936)	1,737
Proportion of Non-Farm Pop. (1936)	8%
Total Acres in District	2,922,186
Acres per Rural Person (1936)	119
Acres per Rural Person (1941)	135
Acres per Farm Person (1936)	129
Acres per Non-Farm Person (1936)	1,682
Number of Farms (1936)	6,110
Number of Farms (1941)	5,581
Decrease in Number of Farms (1936-1941)	529
Average Size of Farm - Total Acres (1936)	419
Average Size of Farm - Improved Acres (1936)	215
Total Acres in District per Farm (1941)	524
Percentage of Tenant Farmers	19%
Value of Farm Property - Total (1936)	$7,122
Value of Farm Property - Buildings (1936)	$1,232
% Population of British Races	58%

M.D.'s & I.D.'s Included in the District. 362-3, 391-4, 421-2-3-4-5, 451-2, 3, 4, 5.

DISTRICT X - WETASKIWIN

(1) Physical Features.

Practically all of the district is a black soil, except for a small portion in the north-east corner, which is mostly grey wooded. The topography varies throughout, although in general it may be spoken of as gently rolling. The Battle River runs through the area making certain sections rolling and hilly, on the other hand much of the land is quite level. The area is within the parkland; consequently it is dotted with tree growth, mostly willow and poplar.

(2) Type of Farming.

Wetaskiwin district typifies well a mixed farming area. Of the improved land, a good proportion produces coarse grains, also most farms have seeded hay and pasture. Live stock emphasis is on cattle and hogs, with some farmers owning purebred beef herds. The district seldom suffers from extreme drought, high wind, or insect pests and generally produces an abundance of hay and coarse grains.

(3) Population.

The census shows an increase in population for 1941 over 1936. This is also reflected in an increase in the number of farms. The average farm population as shown by the township survey agrees well with the district data. About 1/3 of the population is of British decent, while a large proportion are of Scandinavian stock.

(4) Size of Farm.

The average size of farm for the district is slightly under a half section, with approximately half of this under cultivation. This indicates an average of two farmers per square mile. The west

half of the district may be more thickly settled than indicated above as in the eastern half of the area the sample study shows larger farms with more emphasis on wheat growing.

(5) Percentage of Tenant Farmers.

According to the census the proportion of tenant farmers is about 1/5. This is not unduly high if it remains under 1/5. The sample study shows 29% tenant farmers. This is a recent figure and is influenced by men joining the services.

(6) Value of Farm Property.

Total value of farm property is $7,425, buildings $1,384. As the average size of farm is just under 300 acres this shows a good average price per acre. The district is old, well established, and shows a reasonably high real estate value.

(7) Representativeness of the Sample.

After taking careful farm-to-farm survey of the township it was found that a U-shaped area existed in the north of it, not typical of the township as a whole. This lowers the township's average picture. Other townships around Camrose are in a somewhat similar position, e.g., a river, or lake cuts off part of the area. This physical characteristic tends then to lower representativeness of the township. On the whole the picture for the district may be more encouraging. The survey shows only 57% as good prospects; around Wetaskiwin there may be considerably more, certainly the district represents one of the better farming areas of the Province.

FARM ELECTRIFICATION SURVEY

Tp. 47 Rge. 19 W. of 4 Meridian. Tp Near CAMROSE

Good Prospects 21 Per Cent. Good 37%

Fair Prospects 25 Per Cent. Fair 45%

Poor Prospects 10 Per Cent. Poor 18%

Owner Farms 36 Per Cent. Owned 71%

Tenant Farms 15 Per Cent. Tenant 29%

Total Farm Pop. 212 Average Farm Pop. 4.2

Average No. Acres per Farm 334.1 Worked per Farm 271

Proportion of Land Improved 81%

Total Cattle 1,091 Average 21.4 Total Horses 291 Average 5.7

Total Hogs 2,261 Average 44.3 Total Chickens 6,440 Average 126.3

Proportion of Farms with Wells 96% Average Depth 120 ft.
Power for Pumping 44 Percentage 86%

Grain Chopped per Farm 1,791 Bu. Chopped by own Tractor 53%

Other means on Farm 6% off Farm 41%

Proportion Having: Cars 86% Tractors 63% Telephones 33%

Type of House) Frame 49 Stucco ---- Other 2
) Percentage 96.1 Percentage ----- Percentage 3.9

Rooms per House 5.4

Condition of House: Good 37.3% Fair 50.9 % Poor 11.8 %

Condition of Barn : Good 24 % Fair 38 % Poor 38 %

Area per Barn 1,166.7 Sq. Ft. Other Buildings per Farm 2

Distance House to Barn 218 ft. To Water 154 ft.

DISTRICT X - WETASKIWIN

Data From the 1936 & 1941 Census Reports

Total Rural Population (1936)	39,622
Total Rural Population (1941)	40,215
Increase of Population (1936-1941)	593
Farm Population (1936)	34,870
Non-Farm Population (1936)	4,752
Proportion of Non-Farm Pop. (1936)	14%
Total Acres in District	2,391,065
Acres per Rural Person (1936)	60
Acres per Rural Person (1941)	59
Acres per Farm Person (1936)	69
Acres per Non-Farm Person (1936)	503
Number of Farms (1936)	8,045
Number of Farms (1941)	8,189
Increase in Number of Farms (1936-1941)	144
Average Size of Farm - Total Acres (1936)	288
Average Size of Farm - Improved Acres (1936)	163
Total Acres in District per Farm (1941)	292
Percentage of Tenant Farmers	19%
Value of Farm Property - Total (1936)	$7,425
Value of Farm Property - Buildings (1936)	$1,384
% Population of British Races	29%
M.D.'s & I.D.'s Included in the District	426-9, 456-9, 486-9.

DISTRICT XI - VEGREVILLE

(1) Physical Features.

Most of the area is situated in the black soil zone, although the transition soil belt extends into the district part way. For the most part the district is level to gently rolling, with occasional parts somewhat hilly. In some places numerous sloughs and small lakes occur, also some creeks and coulees. The native grass cover is of medium length, typically found in the parkland regions; some parts are almost free from tree growth, while others are dotted with bluffs.

(2) Type of Farming.

At one time the area produced considerable wheat; now the emphasis is mainly on raising live stock. The present quotas on wheat and the favourable live stock prices have stimulated this change. Coarse grains, some flax and seeded hay and pasture account for the greater part of the seeded acreage. Beef cattle plus some dairy products and hogs constitute the main source of income. Like most of the districts in the northern part of the Province, it is not affected by extreme drought and crop production is reasonably certain. However, towards the south and east of the area the above general statement will not always apply.

(3) Population.

A drop in population of almost 2,000 took place between 1936-41; at the same time there was a decrease of 235 in the number of farms. In a relatively good mixed farming area it is not likely this decrease in population and number of farms will continue; possibly by now it has reached a point of stability. Thirty-nine per cent. of the people are of British races, while Ukranians and Germans make up most of the remaining population.

(4) Size of Farm.

In this district the average size of farm is a half-section and half of this is cultivated. This would mean an average of 2 farms per section, an encouraging density figure for probable electrification.

(5) Percentage Tenant Farmers.

The percentage of tenant farmers is 15 for the district and 6 for the sample. Quite probably the present percentage is somewhere between the two figures; at least it is not too high to be a serious drawback.

(6) Value of Property

There are occasional parts of the district that may be described as "spotty". As a result of various physical characteristics, e.g., alkali or transition soil, they are not very productive. This affects the general average value of land; nevertheless the values shown in the table are reasonably good and would reflect an area of good productive capacity.

(7) Representativeness of the Sample.

The Vegreville district is much the same in shape as the Wainwright one just south of it. As pointed out in the Wainwright summary the west end of the district may give a more encouraging picture than the eastern part. This may to some extent be true of the Vegreville area. The Clandonald sample selected is fairly central and should be quite representative. Variations in the two tables appear, while at the same time the sample survey seems to reflect in a fair measure the general data. An accurate statement of representativeness is difficult to make--the sample data may err a little on the optimistic side.

FARM ELECTRIFICATION SURVEY

Tp. 52 Rge. 6 W. of 4 Meridian. Tp. Near CLANDONALD

Good Prospects 24 Per Cent. Good 50%

Fair Prospects 17 Per Cent. Fair 35%

Poor Prospects 7 Per Cent. Poor 15%

Owner Farms 44 Per Cent. Owned 93.6%

Tenant Farms 3 Per Cent. Tenant 6.4%

Total Farm Population 171 Average Farm Population 3.6

Average Number Acres Per Farm 418 Worked per Farm 208

Proportion of Land Improved 50%

Total Cattle 787 Average 16.7 Total Horses 374 Average 8

Total Hogs 1963 Average 41.8 Total Chickens 3495 Average 74.4

Proportion of Farms with Wells 95.7 Average Depth 63 ft.

Power for Pumping 19 Percentage 40%

Grain Chopped per Farm 1334.9 Bu. Chopped by own Tractor 28%

Other means On Farm 8% Off Farm 64%

Proportion having: Cars 66 % Tractors 30 % Telephones 38%

Type of House) Frame 46 Stucco 0 Other 3
Percentage 93.9 Percentage 0 Percentage 6.1

Rooms per House 3.9

Condition of House: Good 22.5 % Fair 46.9 % Poor 30.6 %

Condition of Barn : Good 22.7 % Fair 37.7 % Poor 39.6 %

Area per Barn 679 Sq. Ft. Other Buildings per Farm 2

Distance House to Barn 204 ft. Distance House to Water 348 ft.

FARM ELECTRIFICATION SURVEY

Tp. 50 Rge. 6 W. of 4 Meridian. Tp. Near VERMILION

Good Prospects 12 Per Cent. Good 48%

Fair Prospects 3 Per Cent. Fair 12%

Poor Prospects 10 Per Cent. Poor 40%

Owner Farms 21 Per Cent. Owned 84%

Tenant Farms 4 Per Cent. Tenant 16%

Total Farm Population 69 Average Farm Population 4.3

Average Number Acres per Farm 640 Worked per Farm 370

Proportion of Land Improved 58%

Total Cattle 800 Average 32 Total Horses 325 Average 13

Total Hogs 1700 Average 68 Total Chickens 3875 Average 155

Proportion of Farms with Wells 100% Average Depth 101 ft.

Power for Pumping 15 Percentage 94%

Grain Chopped per Farm 4,320 Bu. Chopped by own Tractor 75%

Other means on Farm 12.5% Off Farm 12.5%

Cars and Trucks per farm: 1.25 Tractors .69 Telephones 87%

Type of House) Frame (x) Stucco Other

Percentage Percentage Percentage

Rooms per House 6.5

Condition of House: Good % Fair % Poor %

Condition of Barn : Good % Fair % Poor %

Area per Barn 1,600 Other Buildings per Farm

Distance House to Barn 162 ft. Distance House to Water

(x) No data secured for some items.

DISTRICT XI - VEGREVILLE

Data from 1936 & 1941 Census Reports

Total Rural Population (1936)	27,026
Total Rural Population (1941)	25,162
Decrease of Population (1936-1941)	1,864
Farm Population (1936)	24,192
Non-Farm Population (1936)	2,114
Proportion of Non-Farm Pop. (1936)	9%
Total Acres in District	1,998,214
Acres per Rural Person (1936)	74
Acres per Rural Person (1941)	79
Acres per Farm Person (1936)	80
Acres per Non-Farm Person (1936)	945
Number of Farms (1936)	5,822
Number of Farms (1941)	5,587
Decrease in Number of Farms (1936-1941)	235
Average Size of Farm - Total Acres (1936)	315
Average Size of Farm - Improved Acres (1936)	164
Total Acres in District per Farm (1941)	358
Percentage of Tenant Farmers	15%
Value of Farm Property - Total (1936)	$6,401
Value of Farm Property - Buildings (1936)	$1,076
% Population of British Races.	39%

M.D.'s & I.D.'s Included in the District 481-5, 511-515.

DISTRICT XII - EDMONTON

(1) Physical Features.

Edmonton district lies within the dark soil belt of the parklands. Much of the land is clear and improved although some bush still is evident throughout the area. The land is mostly level, with some parts gently rolling. The district is considered one of the most productive in the Province.

(2) Type of Farming.

In general, mixed farming is the predominant activity throughout the district, although specialized farming, such as dairying, hog ranching and chicken raising are also common. A reference to the summary tables indicates relatively small farms with a high average of live stock per farm. The 20.2 average for cattle included dairy and beef, but in the Edmonton district this refers almost entirely to dairy cattle. The average per farm of hogs and chickens is also indicative of a more specialized mixed farming area.

(3) Population.

Both summaries indicate a healthy farm population picture. Forty-five per cent. of the population are of British races and the Census shows an increase for 1941 over 1936. The average farm population is over 4 and also the proportion of non-farm population indicates possibilities for future electrification.

(4) Size of Farm.

Both tables show a small average number of acres per farm. This is significant as it means there are on the average about 3 farmsteads per section--a very favorable factor for farm electrification.

(5) Percentage Tenant Farmers.

The percentage tenant farmers for the district is 15, and for the sample it is only 4%. This may indicate a tendency to more owner farms in the area and the proportion may drop below the 15% in the future. This is an advantage from an electrification point of view.

(6) Value of Farm Property.

In the northern districts studied Edmonton stands first in value of farm property. Value of buildings show a fair investment that would indicate buildings are worth installing power in. On the average, farms are small in the district and the high average total value of property shows good productive capacity of the farming area.

(7) Representativeness of Sample.

Many factors seem to indicate that the Edmonton district is a good one for the extension of electric power. The number of farms is on the increase, also the population and the value of property is relatively high. The size of farm and acres improved for the township agree quite well with the district as a whole. Considering all the factors, size of farms, live stock, cars, tractors and value of property, indications are that the township studied is fairly representative and may not be an overestimate for the district as a whole.

FARM ELECTRIFICATION SURVEY

Tp. 51 Rge. 24 W. of 4 Meridian. Tp. Near ELLERSLIE

Good Prospects 76 Per Cent. Good 73%

Fair Prospects 18 Per Cent. Fair 17%

Poor Prospects 10 Per Cent. Poor 10%

Owner Farms 95 Per Cent. Owned 96%

Tenant Farms 4 Per Cent. Tenant 4%

Total Farm Population 406 Average Farm Population 4.1

Average Number Acres per Farm 234 Worked per Farm 134

Proportion of Land Improved 57%

Total Cattle 2002 Average 20.2 Total Horses 609 Average 6.1

Total Hogs 4752 Average 47.8 Total Chickens 21.605 Average 218.2

Proportion of Farms with Wells 97% Average Depth 145 ft.

Power for Pumping 72 Percentage 73%

Grain Chopped per Farm 2818.8 Bu. Chopped by own Tractor 64%

Other Means On Farm 2% Off Farm 34%

Proportion having: Cars 90% Tractors 66% Telephones 13%

Type of House) Frame 87 Stucco 6 Other 6
) Percentage 88 Percentage 6 Percentage 6

Rooms per House 5.7

Condition of House: Good 60.9 % Fair 29.3 % Poor 9.8 %

Condition of Barn : Good 55.4 % Fair 23.9 % Poor 20.7 %

Area per Barn 1344.1 Other Buildings per Farm 3

Distance House to Barn 181 ft. Distance House to Water 155 ft.

DISTRICT XII - EDMONTON

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	19,529
Total Rural Population (1941)	20,206
Increase of Population (1936-1941)	607
Farm Population (1936)	16,712
Non-Farm Population (1936)	2,817
Proportion of Non-Farm Pop. (1936)	17%
Total Acres in District	878,859
Acres per Rural Person (1936)	45
Acres per Rural Person (1941)	43
Acres per Farm Person (1936)	53
Acres per Non-Farm Person (1936)	312
Number of Farms (1936)	3,743
Number of Farms (1941)	3,823
Increase in Number of Farms (1936-1941)	80
Average Size of Farm - Total Acres (1936)	223
Average Size of Farm - Improved Acres (1936)	148
Total Acres in District per Farm (1941)	230
Percentage of Tenant Farmers	15%
Value of Farm Property - Total (1936)	$8,384
Value of Farm Property - Buildings (1936)	$1,783
% Population of British Races	45%
M.D.'s & I.D.'s Included in the District	517-9, 548-9.

DISTRICT XIII - NORTH-EAST FRINGE

(1) Physical Features.

Practically all of the district is a transition soil, although a small part is classified as black. There is considerable variation in the topography; in places it is level to gently rolling; in others it is rolling and hilly, especially near the river. In places rocks and stones are a serious obstacle to cultivation and sometimes sloughs and lakes are frequent. Considerable tree growth of willow and poplar is to be found throughout the area.

(2) Type of Farming.

The district is predominantly mixed farming with the emphasis on hogs. Not a great amount of wheat is produced; the majority of the cultivated acreage is devoted to barley and oats with small amounts of seeded hay and pasture. Seldom does the district suffer from drought or insect damage; thus there is reasonable assurance of good crops with an abundance of feed. The average live stock kept per farm, as shown by the sample, indicates a substantial mixed farming area.

(3) Population.

A small proportional increase in population is shown for the district, with a fair proportional increase in farms. The total farm population is about 9,000 and the total number of farms about 2,000. This gives an average farm population of 4.5. Like the west and north-west fringe districts selected, the north-east fringe area is a comparatively new area of settlement, and large families are often very helpful in developing the new land. Ukranians and French comprise the greater part of the population; only 20% are of British origin.

(4) Size of Farm.

As indicated before the area is comparatively new and it is to be expected farms will not be large. The census shows an average of 99 acres improved and 239 acres as the average size of farm. The latter figure would mean an average of 3 farms per section.

(5) Percentage Tenant Farmers.

Both the district and the sample data show a low percentage tenancy; thus in this area the problem of tenancy would be small.

(6) Value of Property.

A low average value of farm property--less than $4,000 -- is given for the district. Buildings are valued at $745. Generally speaking buildings can be classified as either fair or poor. A large percentage are of log construction; however, many farmers are anxious to build new homes as soon as material is available.

(7) Representativeness of the Sample.

The district and sample data are generally in agreement. It is evident from both that buildings are in most cases fair to poor. The prospects for electricity reveal 68% are either fair or poor. The percentage tenancy is in quite close agreement; also the average farm population is the same for both. Some variation occurs in size of farm and the number of improved acres.

It must be remembered this is not a well developed area and that in a few years from now the picture may be radically changed. At the moment it seems the sample is fairly representative and that the number of good prospects is low.

FARM ELECTRIFICATION SURVEY

Tp. 59 Rge. 8 W. of 4 Meridian. Tp. Near ST. PAUL

Good Prospects 15 Per Cent. Good 31%

Fair Prospects 22 Per Cent. Fair 46%

Poor Prospects 11 Per Cent. Poor 23%

Owner Farms 40 Per Cent. Owned 87%

Tenant Farms 6 Per Cent. Tenant 13%

Total Farm Population 228 Average Farm Population 5

Average Number Acres per Farm 332 Worked per Farm 152

Proportion of Land Improved 46%

Total Cattle 507 Average 11 Total Horses 335 Average 7.5

Total Hogs 1704 Average 37 Total Chickens 3492 Average 75.9

Proportion of Farms with Wells 93.5 Average Depth 32 ft.

Power for Pumping 3 Percentage 6%

Grain Chopped per Farm 1396 Bu. Chopped by own Tractor 28%

Other Means On Farm 2% Off Farm 70%

Proportion Having: Cars 30% Tractors 33% Telephones ----

Type of House)	Frame	Stucco	Other	
	8	-----	39	
	Percentage 17	Percentage ---	Percentage 83	

Rooms per House 3.6

Condition of House: Good 20 % Fair 53 % Poor 27 %

Condition of Barn : Good 13.3 % Fair 44.4 % Poor 42.3 %

Area per Barn: 612.1 Other Buildings per Farm 1.3

Distance House to Barn 202 ft. Distance House to Water 268 ft.

DISTRICT XIII - NORTH - EAST FRINGE.

Data From 1936 & 1941 Census Reports.

Total Rural Population (1936)	10,305
Total Rural Population (1941)	10,588
Increase of Population (1936-1941)	283
Farm Population (1936)	9,022
Non-Farm Population (1936)	1,283
Proportion of Non-Farm Pop. (1936)	14%
Total Acres in District	608,031
Acres per Rural Person (1936)	59
Acres per Rural Person (1941)	57
Acres per Farm Person (1936)	67
Acres per Non-Farm Person (1936)	474
Number of Farms (1936)	1,917
Number of Farms (1941)	1,967
Increase in Number of Farms (1936-1941)	50
Average Size of Farm - Total Acres (1936)	239
Average Size of Farm - Improved Acres (1936)	99
Total Acres in District per Farm (1941)	309
Percentage of Tenant Farmers	10%
Value of Farm Property - Total (1936)	$3,831
Value of Farm Property - Buildings (1936)	$ 745
% Population of British Races	20%
M.D.'s & I.D.'s Included in the District.	543-4, 573, 605.

DISTRICT XIV - SMOKY LAKE - MUNDARE

(1) Physical Features.

The greater part of the area lies within the black soil zone; however, a part near the top is transition or grey wooded soil. There is considerable variation in the topography, ranging from level and undulating to rolling and hilly. Dotted throughout the district are quite a number of sloughs and lakes; also the northern part is cut by the North Saskatchewan River. Considerable bush is found in some parts, while in others only occasional bluffs are found on farms; the grass cover is typical of the parklands.

(2) Type of Farming.

The area is classified as mixed farming with the emphasis on swine. Barley and oats are the chief grain crops with some land in seeded hay and pasture. The district seldom suffers from drought and generally there is plenty of feed and coarse grains. Draught power is supplied by both horses and tractors; in the sample three-quarters of the farms had tractor power.

(3) Population.

The district is predominately Ukranian, with some Roumanian, Polish, German and eight per cent. of British races. Contrary to most of the fringe areas District XIV showed a decrease in population and in the number of farms between 1936 and 1941.

(4) Size of Farm.

There is a wide spread between the average acreage for the district and the sample survey. More emphasis is put on cultivated land and the production of grain crops near Vegreville that in other parts. To the north around Smoky Lake and the fringe, farms are smaller; considerable work has still to be done in clearing land. It is evident the trend is towards larger farms in the older parts of the district.

(5) Percentage Tenant Farmers.

Certainly the problem of tenancy is not acute in this area--only 8% of the farmers are renters. It is to be expected this percentage may remain quite low, at least the sample study coincides with this situation at present.

(6) Value of Property.

Type and construction of farm buildings vary throughout the area. In a number of cases the old buildings erected on first settlement have been replaced by good frame buildings; on the other hand log structures with a mudded wall are not common. Some of these buildings are definitely not worth installing power in. Considering the total value of property and the value of building for the province as a whole the average for the district is low.

(7) Representativeness of the Sample.

A comparison of the two tables suggest there are some variations, especially in size of farm and cultivated acres. The number of tractors together with the reporting of two lighting plants in the township survey will not be typical of the general situation. Certain other variations occur and the probable conclusion is that the sample is above the average. It is not likely the classification of farms "good", "fair", and "poor" will err on the pessimistic side.

FARM ELECTRIFICATION SURVEY

Tp. 53 Rge. 15 W. of 4 Meridian. Tp. Near MUNDARE

Good Prospects 20 Per Cent. Good 33%

Fair Prospects 4 Per Cent. Fair 6%

Poor Prospects 37 Per Cent. Poor 61%

Owner Farms 51 Per Cent. Owned 84%

Tenant Farms 10 Per Cent. Tenant 16%

Total Farm Population 131 Average Farm Population 4.6

Average Number Acres per Farm 508 Worked per Farm 405

Proportion of Land Improved 80%

Total Cattle 1542 Average 22 Total Horses 500 Average 8.2

Total Hogs 2440 Average 40 Total Chickens 11,773 Average 193

Proportion of Farms with Wells 96 Average Depth 62 ft.

Power for Pumping 17 Percentage 61%

Grain Chopped per Farm 2020 Bu. Chopped by own Tractor 43%

Other means On Farm 32% Off Farm 25%

Proportion Farms Having: Cars 1 Tractors .75 Telephones 64%

Type of House	) Frame (x)	Stucco	Other
	) Percentage	Percentage	Percentage

Rooms per House 6

Condition of House: Good % Fair % Poor %

Condition of Barn : Good % Fair % Poor %

Area per Barn 1250 Sq. Ft. Other Buildings per Farm

Distance House to Barn 165 ft. To Water

(x) No data secured for some items.

DISTRICT XIV - SMOKY LAKE - MUNDARE

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	29,449
Total Rural Population (1941)	28,310
Decrease of Population (1936-1941)	1,139
Farm Population (1936)	26,967
Non-Farm Population (1936)	2,482
Proportion of Non-Farm Pop. (1936)	9%
Total Acres in District	1,276,420
Acres per Rural Person (1936)	43
Acres per Rural Person (1941)	45
Acres per Farm Person (1936)	47
Acres per Non-Farm Person (1936)	514
Number of Farms (1936)	5,536
Number of Farms (1941)	5,421
Decrease in Number of Farms (1936-1941)	115
Average Size of Farm - Total Acres (1936)	223
Average Size of Farm - Improved Acres (1936)	130
Total Acres in District per Farm (1941)	235
Percentage of Tenant Farmers	8%
Value of Farm Property - Total (1936)	$5,274
Value of Farm Property - Buildings (1936)	$1,007
% Population of British Races	8%
M.D.'s & I.D.'s Included in the District	516, 545-7, 575-7.

DISTRICT XV - NORTH-WEST FRINGE.

(1) Physical Features.

District XV lies within two soil zones--black and transition or grey wooded. The topography is variable throughout; some parts are level to undulating, while others are rolling and hilly. Frequent sloughs, lakes, creeks and valleys are found in many parts. Occasionally sandy strips with varying tree growth appear. For the most part tree growth is plentiful, except where it has been cleared. The west and north sides of the district are in the bush region and are fairly well wooded.

(2) Type of Farming.

Like most of the northern districts the North-West Fringe area is typically a mixed farming area with the present emphasis on hogs. Only a small proportion of the cultivated land produces wheat; the chief crops are oats and barley.

Although the district seldom suffers from drought, frost damage often occurs. According to the sample study the average live stock per farm is comparatively low. This may not be a general situation.

(3) Population.

Considerable variation in the population occurs--French, Germans and Ukranians are all well represented, with approximately 36 per cent. being of British origin. According to the Census a small increase in population is shown for 1936-41.

(4) Size of Farm.

Typical of the fringe areas the size of farm is relatively small. On the average there are about three farmsteads per square mile. This is a fair density. Considerable bush and other physical features of the land have been a barrier to extensive

cultivation. The average improved acres per farm is small. The district and sample data agree very closely on acreages.

(5) Percentage Tenant Farmers.

It has been pointed out that the fringe areas have a low proportion of tenancy. This area substantiates the previous statement, as it shows only 9 per cent. tenant farmers.

(6) Value of Property.

The value of farm property per acre compares favourably with some of the older, better established areas. The average total value of farm property is $4,604, but this is for an average of 230 acres, which is about $20.00 per acre. Some of the other districts have an average farm value of 7 or 8 thousand, but the acreage value may be below $20.00. The average for buildings is not very high and in many cases they are of log construction with a mud plaster on the outside.

(7) Representativeness of the Sample.

Definite agreement as to size of farm and acres improved is shown for the district and the sample. For the district as a whole the live stock average seems a little low; e.g., most of the areas show a much higher average for horses. The other averages shown on the summary fit the general picture reasonably well. It may not be over pessimistic to take the proportions of "good", "fair", and "poor" prospects as fairly typical of the district.

FARM ELECTRIFICATION SURVEY

Tp. 58 Rge. 2 W. of 5 Meridian. Tp. Near PICKARDVILLE

Good Prospects 20 Per Cent. Good 28%

Fair Prospects 25 Per Cent. Good 35%

Poor Prospects 27 Per Cent. Poor 37%

Owner Farms 71 Per Cent. Owned 97%

Tenant Farms 2 Per Cent. Tenant 3%

Total Farm Population 264 Average Farm Population 3.6

Average Number Acres per Farm 238 Worked per Farm 94

Proportion of Land Improved 40%

Total Cattle 744 Average 10.1 Total Horses 272 Average 3.7

Total Hogs 1802 Average 24.7 Total Chickens 6294 Average 86.2

Proportion of Farms with Wells 81% Average Depth 64 ft.

Power for Pumping 6 Percentage 8

Grain Chopped per Farm 1379 Bu. Chopped by own Tractor 35%

Other means On Farm 13% Off Farm 52%

Proportion having: Cars 48% Tractors 38% Telephones 4%

Type of House) Frame 41 Stucco 3 Other 29
) Percentage 56.2 Percentage 4.1 Percentage 39.7

Rooms per House 4.1

Condition of House: Good 39.7 % Fair 35.6 % Poor 24.7 %

Condition of Barn : Good 37.9 % Fair 24.2 % Poor 37.9 %

Area per Barn 684 Sq. Ft. Other Buildings per Farm 5.2

Distance House to Barn 279 ft. To Water 180 ft.

DISTRICT XV - NORTH-WEST FRINGE

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	26,225
Total Rural Population (1941)	26,873
Increase of Population (1936-1941)	648
Farm Population (1936)	23,593
Non-Farm Population (1936)	2,632
Proportion of Non-Farm Pop. (1936)	11%
Total Acres in District	1,627,060
Acres per Rural Person (1936)	62
Acres per Rural Person (1941)	61
Acres per Farm Person (1936)	69
Acres per Non-Farm Person (1936)	618
Number of Farms (1936)	5,912
Number of Farms (1941)	6,064
Increase in Number of Farms (1936-1941)	152
Average Size of Farm - Total Acres (1936)	230
Average Size of Farm - Improved Acres (1936)	99
Total Acres in District per Farm (1941)	268
Percentage of Tenant Farmers	9%
Value of Farm Property - Total (1936)	$4,604
Value of Farm Property - Buildings (1936)	$ 881
% Population of British Races	36%
M.D.'s & I.D's Included in the District	490, 530, 550, 578-80, 608-10.

DISTRICT XVI - GRANDE PRAIRIE

(1) Physical Features.

The district around Grande Prairie is the only one selected for study in the Peace River area. The greater portion of the soil is black; however, grey wooded soils are to be found, especially on the fringes. For the most part the topography is rolling, although level to gently rolling parts are frequent. Near Grande Prairie are several lakes, while throughout the district sloughs, muskegs and other lakes are common. Where farming is well established the bush cover is similar to other farming areas in the parklands--occasional bluffs. Near the edge of the district typical bush land with a grey wooded soil is common. The area shown on the map is not all well developed farm land. Just north and west of Wembley the only settlement is the occasional farm along the highway, then the situation will change again and broaden out to include quite a number of farms. With the Rocky Mountains visible in the west the scenery presents a very picturesque farming area.

(2) Type of Farming.

The emphasis on certain types of farming shifts, depending on the locality. Just north and west of Grande Prairie wheat farming accounts for a good proportion of the cultivated acreage. Large farms with a full line of machinery are fairly common. Where the soil is not very suitable for wheat growing, coarse grains and grasses are common. Alfalfa, timothy, and brome are grown for hay and seed. Where production factors are not so favourable for wheat growing, mixed farming, with the emphasis on hogs is typical.

(3) Population.

A decrease in population has taken place from 1936 to 1941, also a decrease in the number of farms. In the more outlying parts of district a fair proportion of the farmers are bachelors. In some cases they have turned their farming operations over to someone else and joined the Forces or else sought employment in war projects. It is probable there will be a decided increase in population later when these men return and others come in to take up farming.

(4) Size of Farm.

It is not expected the average size of farm will be large as the small fringe or homestead farm will lower the average. From Grande Prairie to Wembley the farms are large, including the Trelle and Rigby farms. However, a few miles south and west of the above places the soil changes, farms are small and poor. The typical situation is better revealed by the district data, as the sample study is indicative of an area with very favourable soil qualities.

(5) Percentage of Tenant Farms.

The granting of homesteads has been a principal factor in the settlement of the Peace River country. Thus to start off the farmer has owned his own land. With reasonable success he was able to develop the homestead and acquire extra land. This has been an influential factor in reducing the percentage of tenant farmers. If farming practices and settlement of land in the future continue on much the same basis as during the past then the number of tenant farmers should remain about the same.

(6) Value of Farm Property.

In the vicinity of Sexsmith, Grande Prairie, Wembley and

Beaverlodge, large farms, a high proportion cultivated, good machinery, and good frame buildings are common. Many of the farm buildings near the towns mentioned compare well with those around Wetaskiwin, Red Deer and Olds. On the other hand it is often only a few miles from a good area to one with all log buildings. In many cases the total value of all the log buildings would be only a few hundred dollars. Thus, the average for the district is greatly influenced by the less favourable farm picture. The same applies to land; there is rich farm land in one place and grey wooded soil only a short distance away.

(7) Representativeness of the Sample.

Even to the casual traveller the rapid variations in farming areas are evident. This makes if difficult to get a representative sample. It would appear from an examination of the township studied that it reflects fairly well the general picture between Grande Prairie and Wembley and around Beaverlodge, but on the edges of this rectangular block there are many farmers definitely in a more difficult position. It is quite evident the sample data does not reflect the general size of farm or acres improved. For the purposes of electrification there are many farmers in a favourable situation who could be expected to install power; however, this would not be true for the district as a whole.

FARM ELECTRIFICATION SURVEY

Tp. 7 Rge. 8 W. of 6 Meridian. Tp. Near GRANDE PRAIRIE

Good Prospects 39 Per Cent. Good 53%

Fair Prospects 14 Per Cent. Fair 19%

Poor Prospects 21 Per Cent. Poor 28%

Owner Farms 71 Per Cent. Owned 96%

Tenant Farms 3 Per Cent. Tenant 4%

Total Farm Population 241 Average Farm Population 4.1

Average Number Acres per Farm 461 Worked per Farm 362

Proportion of Land Improved 78%

Total Cattle 577 Average 7.8 Total Horses 688 Average 9.3

Total Hogs 2590 Average 35. Total Chickens 8436 Average 114

Proportion of Farms with Wells 95% Average Depth 163 ft.

Power for Pumping 33 Percentage 56%

Grain Chopped per Farm 1650 Bu. Chopped by own Tractor 41%

Other means On Farm 2% Off Farm 57%

Proportion Having: Cars .93 Tractors .90 Telephones 22%

Type of House) Frame (x) Stucco Other

Percentage Percentage Percentage

Rooms per House 5.8

Condition of House: Good % Fair % Poor %

Condition of Barn : Good % Fair % Poor %

Area per Barn 1080 Sq. Ft. Other Buildings per Farm

Distance House to Barn 224 ft. To Water

(x) No data secured for some items.

DISTRICT XVI - GRANDE PRAIRIE

Data from 1936 & 1941 Census Reports

Total Rural Population (1936)	9,845
Total Rural Population (1941)	9,740
Decrease of Population (1936-1941)	105
Farm Population (1936)	9,299
Non-Farm Population (1936)	546
Proportion of Non-Farm Pop. (1936)	6%
Total Acres in District	1,063,125
Acres per Rural Person (1936)	108
Acres per Rural Person (1941)	109
Acres per Farm Person (1936)	114
Acres per Non-Farm Person (1936)	1,947
Number of Farms (1936)	2,558
Number of Farms (1941)	2,438
Decrease in Number of Farms (1936-1941)	120
Average Size of Farm - Total Acres (1936)	301
Average Size of Farm - Improved Acres (1936)	101
Total Acres in District per Farm (1941)	436
Percentage of Tenant Farmers	12%
Value of Farm Property - Total (1936)	$5,173
Value of Farm Property - Buildings (1936)	$ 884
% Population of British Races	49%
M.D.'s & I.D.'s Included in the District	739-41, 771-2.

STATISTICAL SUMMARY OF ALL DISTRICTS

Data from 1936 & 1941 Census Reports.

Total Rural Population (1936)	323,504
Total Rural Population (1941)	318,557
Decrease of Population (1936-1941)	4,947
Farm Population (1936)	289,170
Non-Farm Population (1936)	34,334
Prop. of Non-Farm Pop. (1936)	10.6%
Total Acres in all Districts	26,563,181
Acres per Rural Person (1936)	82
Acres per Rural Person (1941)	83
Acres per Farm Person (1936)	92
Acres per Non-Farm Person (1936)	774
Number of Farms (1936)	69,617
Number of Farms (1941)	68,816
Decrease in Number of Farms (1936-1941)	801
Average Size of Farm - Total Acres (1936)	347
Average Size of Farm - Improved Acres (1936)	---
Total Acres in District per Farm (1941)	386
Percentage of Tenant Farmers	10.5%
Value of Farm Property - Total (1936)	$7,784
Value of Farm Property - Buildings (1936)	$1,363
% Population of British Races	44.7%

SUMMARY OF DISTRICTS

Except for a few brief introductory comments the summary of all the districts will be similar to the outline for each individual one. Excluding two areas, one in the south-east corner of the Province and the other around Peace River and Grimshaw the study has included practically all of the farming area of Alberta. Within the potential service area definite variations in type of farming are to be found, especially as between northern and southern Alberta. One type of farming may give as great a net return as another, but other factors e.g., size of farm may vary greatly. This has already been discussed under the separate district summaries.

Other information related to electrification may be briefly referred to here. The proportion of non-farm population is of some significance. Where this proportion is high it would mean there are service stations, stores, elevators, etc., throughout the district and these may become users of central station power.

The sample data also include information on the number of wells power for pumping, type of house and condition, rooms per house, distance from house to barn and distance from house to water. Some of these figures are necessary in order to determine the cost of installing power, e.g., the amount of wiring required. When all the data were recieved from each individual farmer a rating "good", "fair", or "poor" was put on the record. The total of these ratings and the percentage of each is shown for each district.

Each district was described under seven headings; the following remarks relate to these same headings only all the districts are considered.

(1) Physical Features.

With the exception of Peace River practically all of the farming area of the province is on the prairie or parklands. Generally speaking, the situation for the prairie districts is the same--topography, soil, grass and bush cover and seasonal climatic conditions. None of these present important barriers to the erection of power lines or to servicing them the year round. In the parklands, more sloughs, lakes and coulees are encountered, besides, some of the road allowances are not as clear and open as those on the prairie. Nevertheless, as shown by existing power lines, the general physical features of the Province do not present problems sufficiently great as to become deciding factors in rural electrification.

(2) Type of Farming.

Studies of agriculture usually reveal wide variations in systems of farming at different periods of time. Farmers are at first uncertain as to the best crops to grow and in what proportions, gradually by trial and error a more permanent system of farming develops. This has been the situation in Alberta and as a result wheat farming and ranching have become the typical practice on the greater part of the prairie with mixed farming being predominent in the parklands. The information gathered on each district studied agrees with this general situation. Variations occur but on the whole farms are larger in the south, a greater proportion of the land is cultivated and fewer live stock are kept. This of course does not apply to the irrigated districts.

(3) Population.

The average population per farm was obtained for each of the township samples. For the first districts in the south the average for the samples is 3.7 and for the other northern districts the

average is 4.6, almost an average of one person more per farm. The fringe areas have a high number of persons per farm, and a relatively small proportion of the people are of British origin. The older settled areas, such as Calgary and Red Deer have a larger proportion of the population of British stock; whereas, the area east of Edmonton and the fringes have a high percentage of Ukranian, French and German nationalities.

(4) Size of Farm.

Districts may be classified as follows with regard to size of farm:

500 acres and over	- Districts I and III
401 to 500 acres	- Districts IV, V, VI and IX
301 to 400 acres	- Districts II, VII, XI, and XVI
200 to 300 acres	- Districts VIII, X, XII, XIII, XIV and XV

The average improved acres per farm for each district are as follows:

400 acres and over	- District I
301 to 400 acres	- District III
201 to 300 acres	- Districts II, IV, V, VI and IX
101 to 200 acres	- Districts VII, VIII, X, XI, XII, XIV and XV
0 to 100 acres	- Districts XIII and XV

From the above it is evident the large farms with large improved acreages occur in the south. Particularly noticeable is the fact--with the exception of District II--that districts I, III, IV, VI, and IX may be grouped together as those with the greatest total and improved acreages. This is significant from an electrification point of view as it indicates the average number of farms per square mile.

(5) Percentage Tenant Farmers.

The percentage of tenant farmers has a definite effect on the extension of electric power. In any given situation other things being equal the probability of owners installing power is greater than for renters. A brief summary of the percentage tenant farmers in each district will be sufficient to indicate the general picture.

Percentage tenants 30 and over - District III

" " 20 to 29 - Districts II, IV, V, VI, VII

" " 10 to 19 - " I, VIII, IX, X, XI, XII, XIII, XVI

" " 0 to 9 - Districts XIV, XV

(6) Value of Farm Property.

It has already been pointed out that District I has the highest property value per farm with District III as second and District IV third. However, this value is for a large acreage, and the per acre value may be below $20, whereas for other districts in the north, e.g., Edmonton, it is just under $40. For some comparisons the acreage value would appear to give a more accurate picture. The value of farm buildings gives a more clear cut picture and from the data it is evident the southern part of the Province has consider- considerably higher average value that the north.

(7) Representativeness of the Sample.

At the end of each district summary the representativeness of the sample has been discussed. Difficulties arise in attempting to interpret the representativeness of the sample in any district. It seems apparent that the degree of representativeness varies. In some cases the sample appears to reflect conditions more favorable to farm electrification than would be true of the district in general; in other cases, the sample may reflect less favorable conditions. Over the whole service area some of these discrepancies would be compensating.

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RURAL ELECTRIFICATION IN ALBERTA

Appendix 11

Specifications for Farm Distribution Lines, Unit Structure Costs, and Other Technical Material

RURAL ELECTRIFICATION IN ALBERTA

APPENDIX 11

SPECIFICATIONS FOR FARM DISTRIBUTION LINES, UNIT STRUCTURE COSTS, AND OTHER TECHNICAL MATERIAL.

ACKNOWLEDGEMENTS

This Appendix brings together a large amount of technical material accumulated during the course of the study, and which served as the basis for cost estimates included in the Report.

Unit structure specifications, drawings and cost estimates were prepared by both Calgary Power Company and Canadian Utilities Limited; and the engineers of the two companies prepared the estimates of farm costs. This material is included in the Appendix as prepared and summarized by the Companies.

Dominion Electric Power Company have given consideration to the extension of rural lines in the Peace River district. Material made available by the Company is also included in the Appendix.

Drawings and specifications were submitted to Mr. Vernon Pearson, Mechanical Superintendent, Mechanical Branch, Edmonton. A copy of a memorandum from Mr. S.A.B. Kembry, Chief Electrical Inspector, was made available by Mr. Pearson.

Calgary Power Company and Canadian Utilities Limited were asked for estimates of the spare generating capacity at the end of the war. The estimates provided by the Companies are included in the Appendix.

The material presented provides ample evidence of the large contribution made by the Companies, and of the extent to which the early completion of the Report was made possible by their participation.

The late Professor W.E. Cornish, and subsequently Mr. W.I. McFarland assisted in the interpretation of the technical material assembled.

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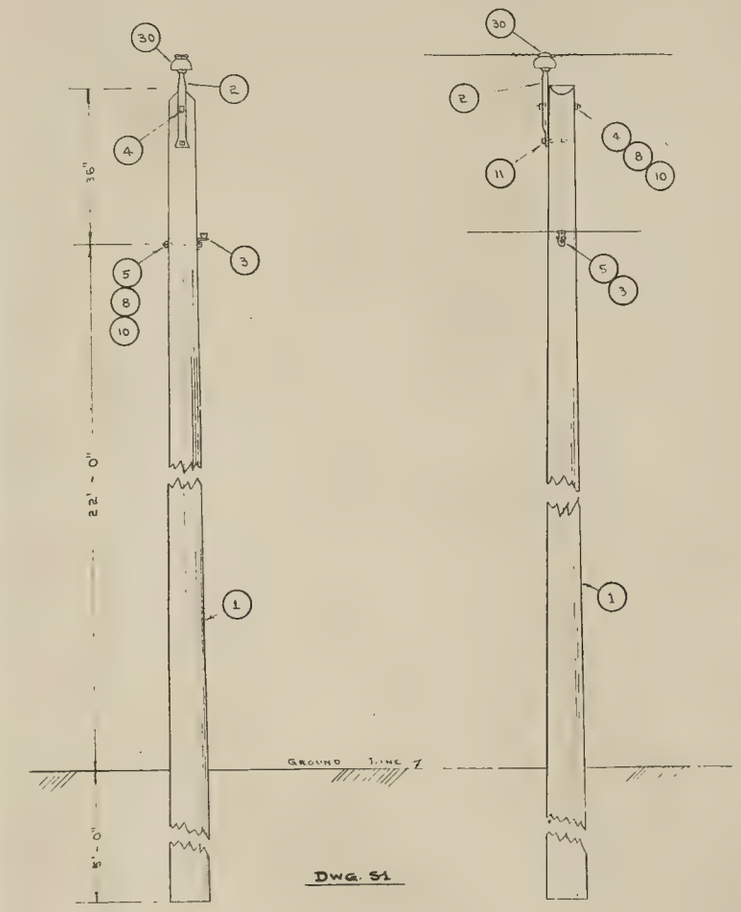
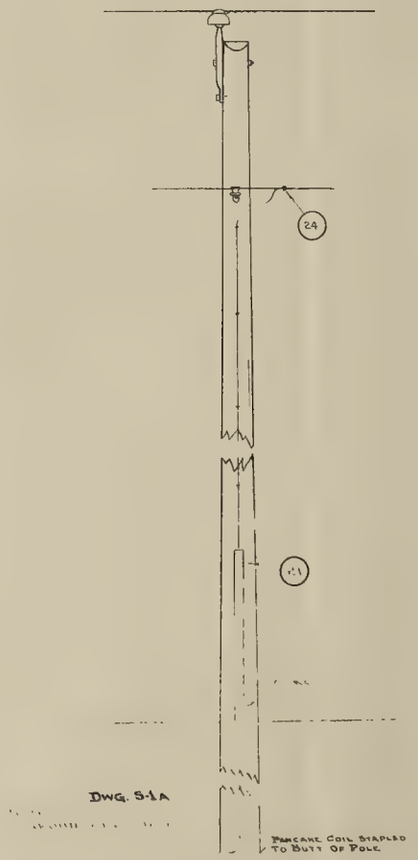


DWG. S-1



DWG. S-1A

BILL OF MATERIAL

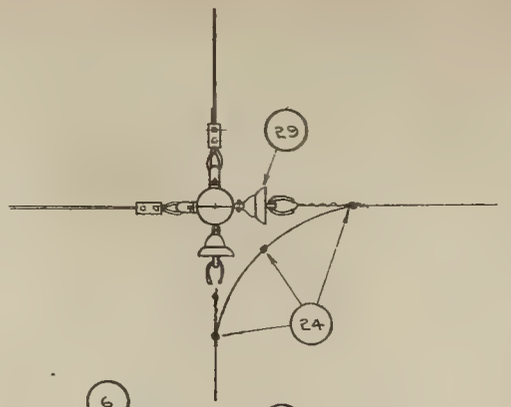
I	Q	DESCRIPTION
1	1	30' CLASS 6 ASA CEDAR POLE ½" BUTT TREATMENT, ROOFED,
		DRILLED 2-½" HOLES.
2	1	POLE TOP PIN, SLATER #303A OR SIMILAR 9/16" HOLES
3	1	NEUTRAL BRACKET SLATER #4480 OR SIMILAR
30	1	PIN TYPE INSULATOR, CANADIAN PORCELAIN #505 OR SIMILAR
4	1	MACHINE BOLT ½" x 8"
5	1	MACHINE BOLT ½" x 10"
8	2	SQUARE WASHERS 2" x 2" x 9/16" HOLE
10	2	LOCK OR PAL NUTS
11	1	LAG BOLT ½" x 4"
		FOR GROUNDING ON TANGENT STRUCTURE ADD: S-1A
24	1	WIRE CONNECTOR KEARNEY #6885 OR SIMILAR
	50'	LINE WIRE - #6 OR LARGER
23	8	2" STAPLES
21	1	GROUND WIRE GUARD
	8	WIRE NAILS 3"

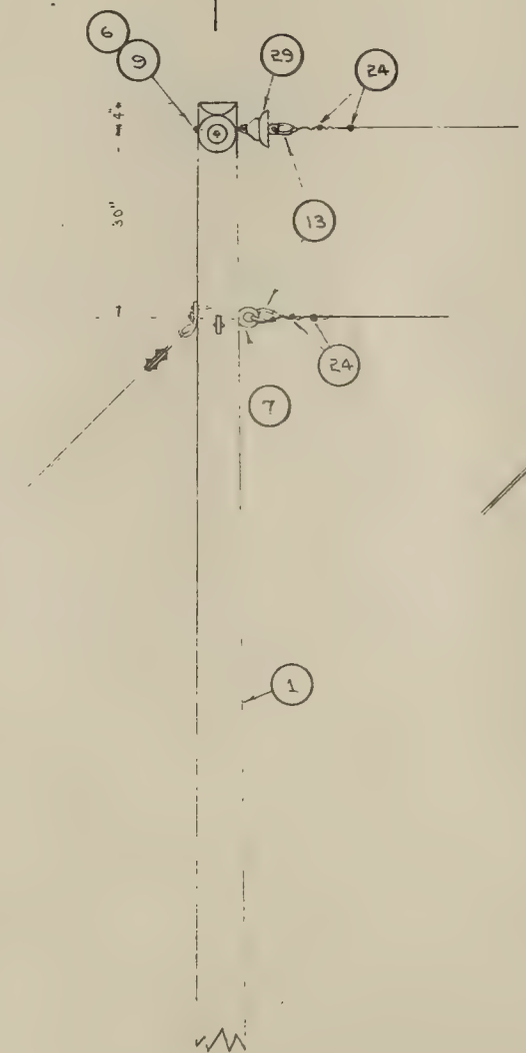
DWG. NO. S-1

PROPOSED TANGENT STRUCTURE
FOR SINGLE PHASE
6900 VOLT FARM LINE

Scale ½" - 1'

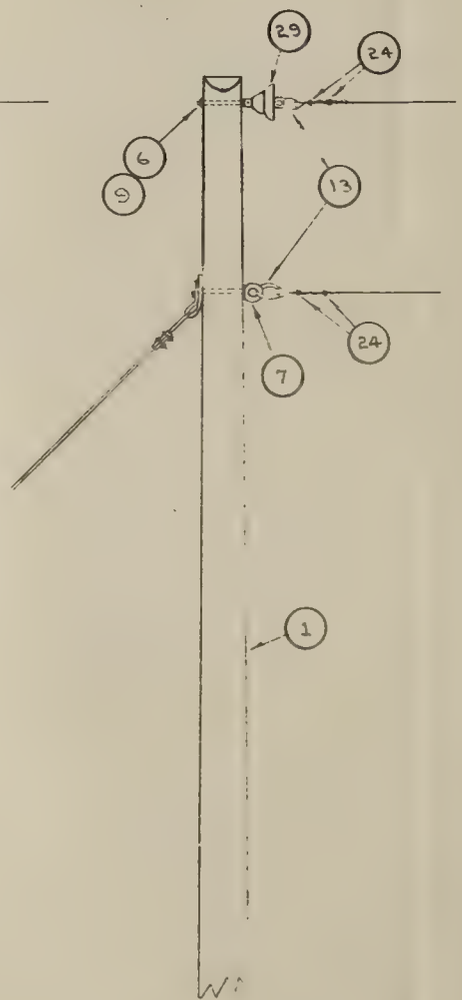
Date 30/12/43 Dwg. No. C.O.





S-2B

RIGHT ∠ STR.



S-2A

DEAD END STR.

BILL OF MATERIAL

I	Q	DESCRIPTION S-2B
1	1	30' CLASS 6 ASA CEDAR POLE ½" BUTT TREATMENT, ROOFED,
		DRILLED 2-¾" HOLES
29	2	SUSPENSION INSULATOR C.P. #8080, SIMILAR
6	2	EYEBOLT ⅝ x 8"
7	2	EYEBOLT ⅝ x 10"
9	3	SQUARE WASHERS 2"x 2"x 11/16" HOLES
13	4	THIMBLE ⅜"
24	10	WIRE CONNECTORS KEARNY #6885 OR SIMILAR
		MATERIAL FOR S2A
1	1	30' CLASS 6 A.S.A CEDAR POLE ½" BUTT TREATED, ROOFED & DRILLED
29	1	SUSPENSION INSULATOR C.P. #8080 OR SIMILAR
6	1	EYEBOLT ⅝"x 8"
7	1	EYEBOLT ⅝"x 10"
9	2	SQUARE WASHERS 2"x 2"x 11/16" HOLE
13	2	THIMBLE ⅜"
24	6	WIRE CONNECTORS KEARNY #6885 OR SIMILAR

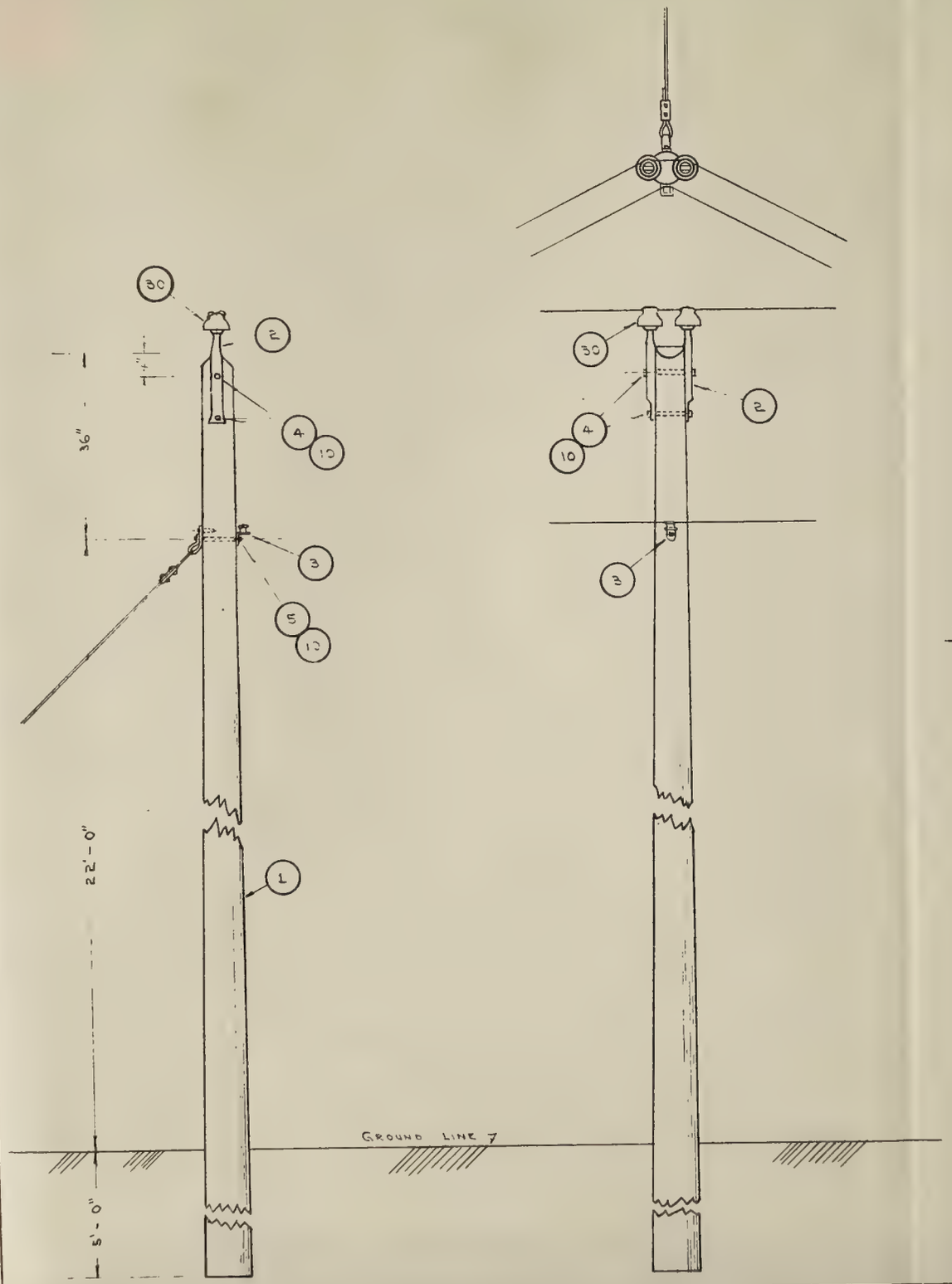
NOTE:
USE GUYING SPECIFIED ON DWG. S-10 AS REQUIRED.

DWG. NO. S-2

PROPOSED RIGHT ANGLE & DEAD END STRUCTURE FOR SINGLE PHASE 6900 VOLT FARM LINE

Scale ½" - 1'

Date 4/1/44 Dwg. No. C.O.



BILL OF MATERIAL

ITEM	QTY	DESCRIPTION
1	1	30' CLASS C A.C.A. CEDAR POLE ½ BETT TREATMENT, ROOFED, DRILLED WITH 2-½ HOLES
2	2	POLE TOP PIN SLATER #3034 OR SIMILAR WITH ⅝" HOLES
3	1	NEUTRAL BRACKET SLATER #4480 OR SIMILAR
30	2	PIN TYPE INSULATOR C.P. #505 SIMILAR
4	2	MACHINE BOLTS ½" x 8"
5	1	MACHINE " ½" x 10"
8	1	SQUARE WASHER 2"x2" x 9/16" HOLE OR GUYED POLE
10	3	LOCK OR PAL NUTS

NOTE:
IF USED AS ANGLE STRUCTURE (UNDER 30°) ADD THE COST OF GUYING AS PER. SHEET #8 TO 11 AND DWG #S-10

DWG. #S-4

PROPOSED ANGLE OR CROSSING STRUCTURE FOR SINGLE PHASE

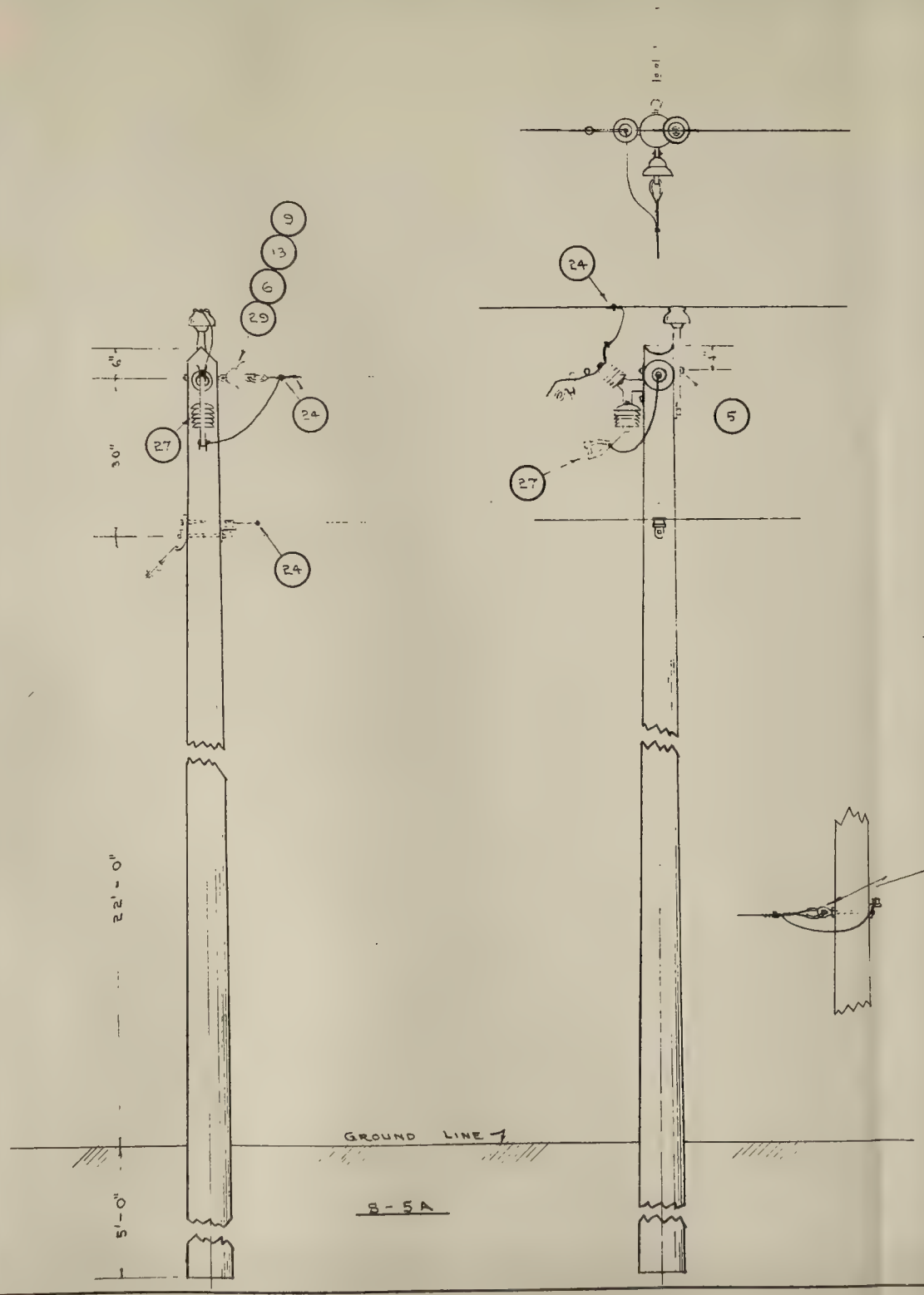
6900 VOLT FARM LINE

Scale ½"-1' "ANGLES UNDER 30°"

Date 29/12/43 Dwg. No. C.O.

BILL OF MATERIAL

No.	Qty	Description
27	1	TRIPOUT DISCONNECTING SWITCH KEARNEY #9003 OR SIMILAR
42	1	FUSE LINK AS SPECIFIED
29	1	SUSPENSION INSULATOR CP#5280 OR SIMILAR
6	1	EYEBOLT 5/8 X 8"
9	1	SQUARE WASHER 2"X2"X 11/16 HOLE
13	1	THIMBLE 3/8"
24	8	WIRE CONNECTORS KEARNEY #6855 OR SIMILAR
5	1	MACHINE BOLT 1/2 X10" TO REPLACE 1/2 X8" ON POLE



NOTE:

WIRING TO BE ADDED AS PER SHEET #8 TO 11 DRAWING #S-10.

S-5B TAP ON EXISTING STRUCTURE WITHOUT DISCONNECT, MATERIAL AS DETAILED ON SHEET 5

NOTE:

ADD 1-5/8 X10" EYEBOLT AND ONE THIMBLE TO THE ABOVE FOR TAPS ON THE PROPERTY SIDE. + 2 WIRE CONNECTORS

DWG. NO S-5

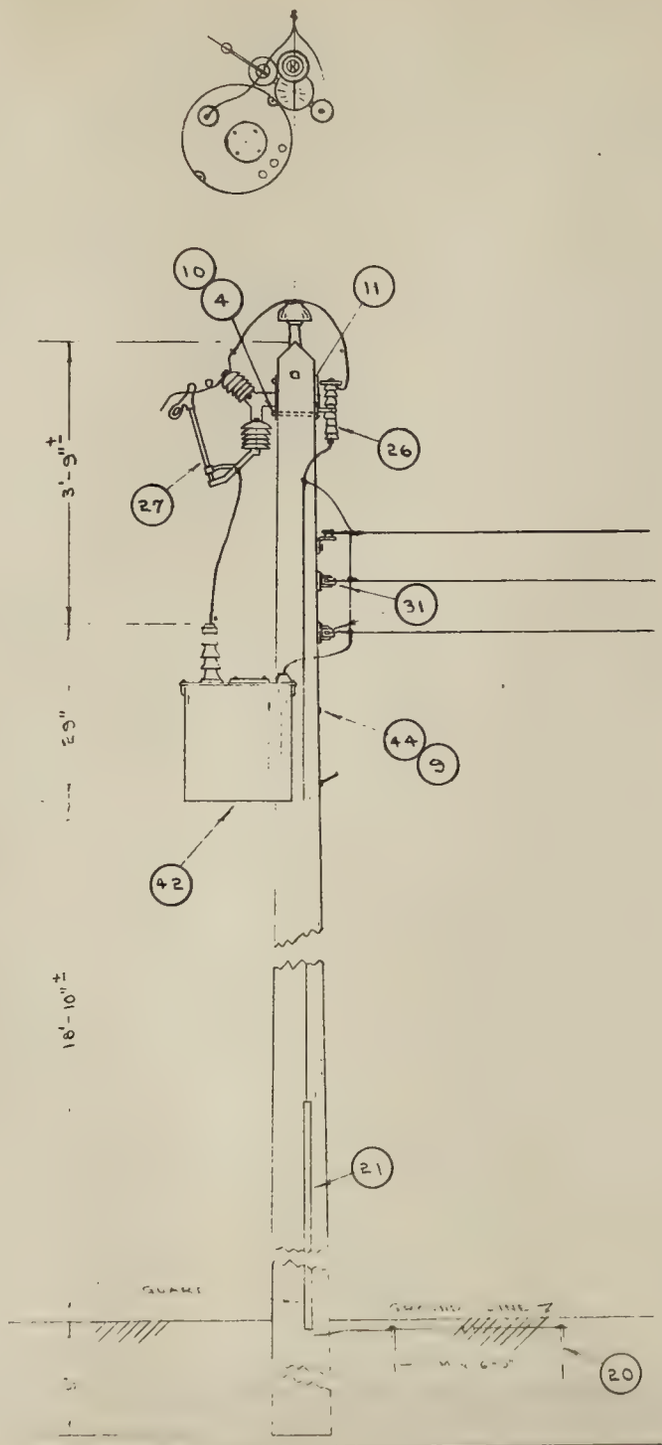
PROPOSED FUSED TAP ON EXISTING STRUCTURE

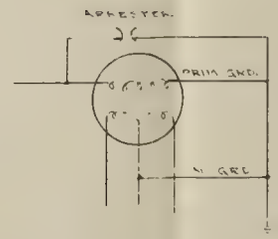
FOR

6900 VOLT FARM LINE

Scale 1/2" - 1'

Date 3/1/44 Dwg. No. C.O.





NOTE
1 - GROUND WIRE - 7 FT
2 - METER - COMPLETE AS SHOWN

BILL OF MATERIAL

I	Q	DESCRIPTION
42	1	TRANSFORMER 1½KVA 6900/230/115 VOLT COMPLETE WITH OIL -
		MOLONEY PIVOT TYPE OR SIMILAR.
27	1	TRIPOUT, DISCONNECTING SWITCH - KEARNEY #9000 OR SIMILAR.
43	1	FUSE LINK, 1 AMP - KEARNEY #6413-2 OR SIMILAR
26	1	LIGHTNING ARRESTER CLM-305063-53, OR SIMILAR
4	2	MACHINE BOLT ½" x 8"
44	2	MACHINE BOLT ⅝" x 10"
20	2	GROUND RODS, SLATER #9338-C OR SIMILAR
31	3	SERVICE INSULATOR, SLATER #190 OR SIMILAR, "OR RACK"
25	8	WIRE CONNECTORS, BURNDY SERVITS KS 20 SIMILAR
	5#	GROUND WIRE #4 D.W.P. STRANDED
21	1	GROUND WIRE GUARD
23	12	STAPLES 2"
9	6	SQUARE WASHERS 2" x 2" x 1/16" HOLE
10	4	PAL OR LOCK NUTS ½"
11	2	LAG BOLTS ⅜" x ½"

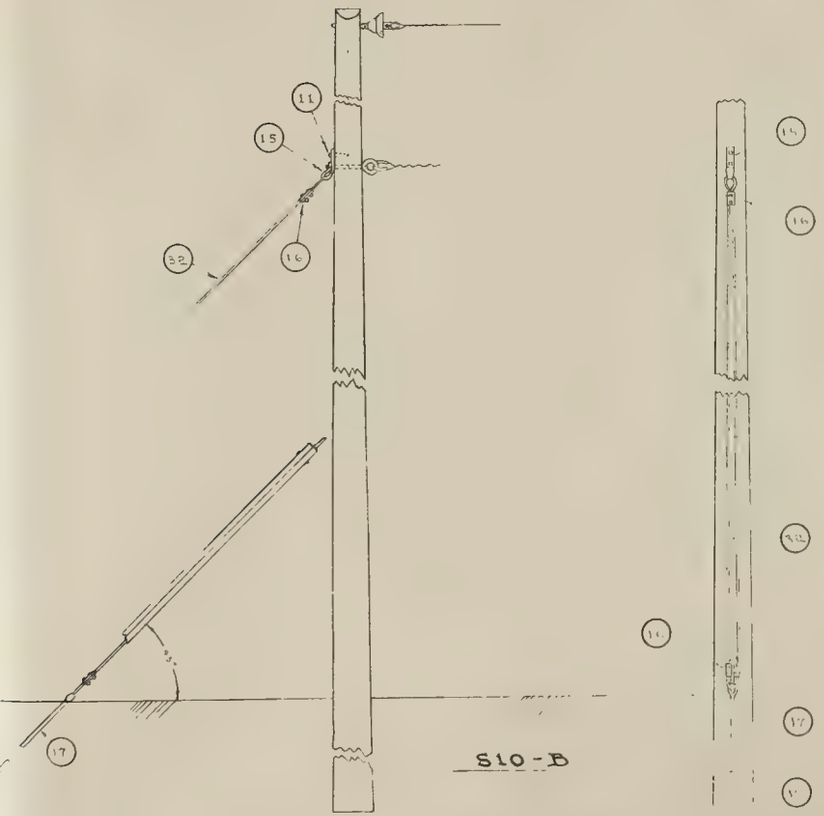
NOTE:
THIS MATERIAL IS FOR SUBSTATION ON EXISTING STRUCTURES. STRUCTURE SHOWN IS S-8A. STRUCTURE WITHOUT DISCONNECTS IS A S-8B

DWG. #S-8

PROPOSED 6900/230/115 VOLT FARM SUBSTATION ON LINE POLE

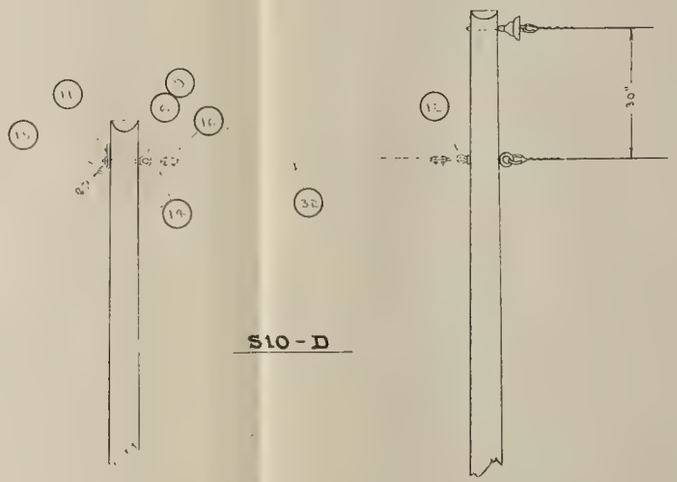
Scale ½" - 1'

Date 3/1/44 Dwg. No. C.O.



OVERHEAD, STUB & GUY

PLAN VIEW



S10-D

BILL OF MATERIAL		
I	Q	DESCRIPTION
		LIGHT HEAD GUY S-10A
15	1	GUY FITTING - SLATER #6001 OR SIMILAR
11	1	LAG BOLT 4" x ⅝"
16	3	GUY CLAMPS - 2 BOLT, SLATER #7448 OR SIMILAR
17	1	ANCHOR ROD ¾" x 6' SLATER #8506 OR SIMILAR
18	1	EXPANDING ANCHOR, SLATER #C-62 H, 5,000 LBS. HOLDING POWER
32	40'	GUY WIRE ¼" - 7 STRANDED (129 LBS. /M' BRK. STR. MIN. 3400 LBS)
		HEAVY HEAD GUY S-10B
15	1	GUY FITTING - SLATER #6001 OR SIMILAR
11	1	LAG BOLT 4" x ⅝"
16	3	GUY CLAMPS - 2 BOLT, SLATER #7448 OR SIMILAR
17	1	ANCHOR ROD ¾" x 6' - DOUBLE THIMBLE EYE SLATER #8506 OR SIMILAR
19	1	EXPANDING ANCHOR, SLATER #C-834-H OR SIMILAR. (HOLDING POWER 9000 LBS. IN AVERAGE SOIL)
32	70'	GUY WIRE - ¼" - 7 STRAND. DOUBLED (MIN. BRK. STRENGH - 3400 LBS.) 129#/M'
		LIGHT OVERHEAD, STUB & GUY S-10C
12	1	DOUBLE THIMBLE EYENUT ⅝" SLATER #22115 OR SIMILAR
6	1	EYEBOLT ⅝" x 8" SLATER #9958 OR SIMILAR
14	1	THIMBLE ½" SLATER #7594 OR SIMILAR
9	1	SQUARE WASHER 2" x 2" x 13/16" HOLE
16	2	GUY CLAMP 2 BOLT SLATER #7448 OR SIMILAR
32	90'	GUY WIRE ¼" 7 STRAND 129#/M'
	1	25' CEDAR POLE, CLASS 6 - BUTT TREATED & ROOFED
	1	LIGHT HEAD GUY COMPLETE AS ABOVE IN S-10A
		HEAVY OVERHEAD, STUB & GUY S-10D
12	1	DOUBLE THIMBLE EYENUT ⅝" SLATER #22115 OR SIMILAR
6	1	EYEBOLT ⅝" x 8" SLATER #9958
14	2	THIMBLES ½", SLATER #7594 OR SIMILAR
9	1	SQUARE WASHER 2" x 2" x 13/16" HOLE
16	3	GUY CLAMP, 2 BOLT - SLATER #7448 OR SIMILAR
32	130'	GUY WIRE ¼" - 7 STRAND. DOUBLED 129#/M' 3400# MIN. BRK. STRENGTH
	1	25' CLASS 6 CEDAR POLE, BUTT TREATED AND ROOFED.
	1	HEAVY HEAD GUY COMPLETE AS ABOVE IN S-10B

NOTE.
ADD GUY GUARDS WHERE NECESSARY.
S10-A & S10-C SIMILAR BUT WITH SINGLE GUY WIRE & LIGHT ANCHOR.

DWG. NO. S-10

PROPOSED GUYING FOR SINGLE PHASE 6900 VOLT FARM LINES

Scale 1" - 1'

Date 30/12/43 Dwg. No. C.O.

11. Cost Estimates for Eight Areas. (Calgary Power Company)

1. Detailed Cost Estimate for the Construction of:

6900 VOLT FARM LINE -- PRELIMINARY COST ESTIMATE

Tangent Structure --- Drawing # S-1

		Unit Cost	Total	
MATERIAL:				
1	30 ft. class 6 ASA cedar pole, ½" butt treatment, roofed, drilld 2-½" holes.	7.84	7.84	
1	Pole top pin, Slater #303A or similar, 9/16" holes.	.79	.79	
1	Neutral bracket Slater #4480 or similar.	.29	.29	
1	Pin type insulator, Canadian Porcelain, # 505 or similar.	.18	.18	
1	Machine bolt ½" x 8"	.09	.09	
1	Machine bolt ½" x 10"	.11	.11	
2	Square washers 2" x 2" x 9/16" hole	.03	.06	
2	Lock or pal nut	.02	.04	
1	Lag bolt ½" x 4"	.05	.05	
	Estimated Material ----------		9.45	9.45
LABOR:				
	Staking and clearing Right of Way		1.50	
	Digging, assembling, erecting and trucking.		3.50	
	Estimated Labor - - - - - - - - - - - -			5.00
	Total estimated labor and material ------		14.45	
	Contingencies, miscellaneous and incidentals, 5%		.72	.72
			15.17	
OVERHEAD:				
	Engineering, drawings, prints, route plans, approvals, purchasing and handling of material, supervision of construction and accounting --- 10%		1.52	1.52
	Total cost per tangent structure -----		$ 16.69	16.69

NOTE: (1) Add $2.75 to the above total if a 35' pole is used.
(2) Two 35' poles to be allowed per mile, for grading purposes.
(3) Line Neutral to be grounded at intervals of not less than 2000'.
Add $ 1.97 to the above total for grounding a tangent structure.

Drawing # S-1A "Tangent Structure Grounding".

6900 VOLT FARM LINE --- Preliminary Cost Estimate

Dead End Structure ----- Drawing # S-2A

	MATERIAL:	Unit Cost	Total	----
1	30 ft. class 6 ASA cedar pole, $\frac{1}{2}$" butt treatment, roofed, drilled, 2-$\frac{1}{2}$" holes.	7.84	7.84	
1	Suspension insulator C.P. # 8080, similar	1.71	1.71	
1	Eyebolt 5/8 x 8"	.28	.28	
1	Eyebolt 5/8 x 10"	.33	.33	
2	Square washers 2" x 2" x 11/16" holes	.03	.06	
2	Thimble 3/8"	.05	.10	
6	Wire connectors Kearny # 6885, similar	.16	.96	
	Estimated Material		11.28	11.28
	LABOR:			
	Staking and clearing Right of Way		1.50	
	Digging, assembling, erecting, trucking		4.00	
	Estimated Labor			5.50
	Estimated material and labor		16.78	
	Contingencies, miscellaneous and incidentals 5%		.84	.84
			17.62	
	OVERHEAD:			
	Engineering, drawings, prints, route plans, approvals, purchasing and handling of material, supervision of construction and accounting 10%		1.76	1.76
			19.38	19.38

NOTE: Guying costs to be added as per sheet # 8 to 11.
Drawing # S - 10

6900 VOLT FARM LINE ------ Preliminary Cost Estimate

Right Angle Structure -------- Drawing # S - 2B

		Unit Cost	Total	----
MATERIAL:				
1	30 ft. class 6 ASA cedar pole (selected) $\frac{1}{2}$" butt treatment, roofed and drilled with 2-$\frac{1}{2}$" holes.	7.84	7.84	
2	Suspension insulator Canadian Porcelain # 8080, similar.	1.71	3.42	
2	Eye bolts 5/8 x 8"	.28	.56	
2	Eye bolts 5/8 x 10"	.33	.66	
3	Square washers 2" x 2" x 11/16" hole.	.03	.09	
4	Thimble 3/8"	.05	.20	
10	Wire connectors Kearney # 6885, similar	.16	1.60	
	Estimated Material		14.37	14.37
LABOR:				
	Staking and clearing Right of Way.	1.50		
	Digging, assembling, erecting and trucking	4.50		
	Estimated Labor		6.00	6.00
	Estimated labor and material		20.37	
	Contingencies, miscellaneous and incidentals 5%		1.02	1.02
			21.39	21.39
OVERHEAD:				
	Engineering, drawings, prints, route plans, approvals, purchasing and handling of material, supervision of construction and accounting 10%		2.14	2.14
	Total estimated cost per right angle structure			23.53

NOTE: Guying costs to be added as per sheet # 8 to 11 and drawing # S - 10

6900 VOLT FARM LINE --- PRELIMINARY COST ESTIMATE

Small angle Structure (under 30°) Drawing # S-4

		Unit Cost	Total	
MATERIAL:				
1	30 ft. class 6 ASA cedar pole, ½" butt treatment, roofed, drilled with 2-½" holes	7.84	7.84	-----
2	Pole top pin. Slater # 3034 or similar with 9/16" holes	.79	1.58	
1	Neutral bracket Slater # 4480 similar	.29	.29	
2	Pin type insulator C.P. #505 similar	.18	.36	
2	Machine bolts ½" x 8"	.09	.18	
1	Machine bolt ½" x 10"	.11	.11	
1	Square washer 2" x 2" x 9/16" hole	.03	.03	
3	Lock or pal nuts	.02	.06	
	Estimated Material		10.45	10.45
LABOR:				
	Staking and clearing Right of Way		1.50	
	Digging, assembling, erecting and trucking		3.75	
	Estimated Labor		5.75	5.75
	Total estimated material and labor		16.20	
	Contingencies, miscellaneous and incidentals 5%		.81	.81
			17.01	
OVERHEAD:				
	Engineering, drawings, prints, route plans, approvals, purchasing and handling of material supervision of construction and accounting - 10%		1.70	1.70
	Total estimated cost per small angle structure			18.71

NOTE: Add the cost of guying as per sheet # 8 to 11 and drawing # S - 10

Add $ 2.75 to the above total if a 35 ft. pole is used.

6900 VOLT FARM LINE ---- Preliminary Cost Estimate

Tap on Existing Tangent Structure (No disconnect) S - 5B

		Unit Cost	Total	
MATERIAL:				
1	Hot line clamp Kearney 3517 - A	.97	.97	
1	Suspension insulator C.P. # 8080, similar	1.71	1.71	
1	Eye bolt 5/8 x 8"	.28	.28	
1	Square washer 2" x 2"x11/16" hole	.03	.03	
7	Wire connectors Kearney # 6885 similar	.16	1.12	
1	Thimble 3/8"	.05	.05	
	Estimated Material		4.16	4.16
LABOR:				
	Erecting and trucking		1.00	
	Estimated labor			1.00
	Estimated Labor and material		5.16	
	Contingencies, miscellaneous and incidentals 5%		.26	.26
			5.42	
OVERHEAD:	----- 10% ----		.54	.54
	Total estimated cost for tap		5.96	5.96

NOTE:

(1) Guying costs to be added as per sheet # 8 to 11 Drawing # S - 10

(2) Add 1 - 5/8 x 10" eyebolt and one thimble for taps on the property side or add $1.00 to the above cost.

6900 VOLT FARM LINE -- Preliminary Cost Estimate

Fused Tap on Existing Tangent Structure -- Drawing # S-5A

		Unit Cost	Total	
MATERIAL:				
1	Tripout disconnecting switch, Kearney #9000, or similar.	11.40	11.40	
1	Fuse link as specified	.40	.40	
1	Suspension insulator CP # 8080, similar,	1.71	1.71	
1	Eyebolt 5/8 x 8"	.28	.28	
1	Square washer 2" x 2" x 11/16 hole	.03	.03	
1	Thimble 3/8"	.05	.05	
8	Wire connectors, Kearney # 6885, similar	.16	1.28	
1	Machine bolt $\frac{1}{2}$ 10" to replace $\frac{1}{2}$ x 8" top pin	.02	.02	
	Estimated Material		15.17	15.17
LABOR:	Erecting and trucking		1.50	1.50
	Estimated Labor and Material		16.67	
	Contingencies, miscellaneous and incidentals 5%		.83	.83
			17.50	
OVERHEAD:				
	Engineering, drawings, prints, route plans, approvals, purchasing and handling of material, supervision of construction and accounting, 10%		1.75	1.75
	Total estimated cost for fused tap		19.25	19.25

Note:

(1) For unfused tap on existing tangent structure see sheet # 5 — 19.22 (used on est.)

(2) Guying costs to be added as per sheet #8 to 11 Drawing # S-10

(3) Add 1-5/8 x 10" eyebolt and 1 thinble to the above for taps on the property side or add 1.00 to the above cost.

6900 VOLT FARM LINE --- Preliminary Cost Estimate

Farm Substation (on Existing Structure) Drawing # S-8

	MATERIAL:	Unit Cost	Total	
1	Transformer -1½ KVA, 6900/230/115 volt complete with oil - Moloney Pivot type, or similar.	81.55	81.55	
1	Tripout, disconnecting switch - Kearney # 9000 or similar.	11.40	11.40	
1	Fuse link, 1 amp.-Kearney #6413-2, or similar.	.40	.40	
1	Lightning arrester CIM-305063-53, similar	14.97	14.97	
2	Machine bolt ½" x 8"	.09	.18	
2	Machine bolt 5/8" x 10"	.15	.30	
2	Ground rods, Slater # 9338-C or similar	1.24	2.48	
3	Service insulator, Slater # 190 or similar.	.23	.69	
8	Wire connectors.. Burndy servits KS 20 similar	.21	1.68	
5#	Ground wire #4 DBWP Stranded	.20	1.00	
1	Ground wire guard	.30	.30	
12	Staples 2"	.10	.10	
6	Square washers 2" x 2" x 11/16" hole.	.03	.18	
4	Pal or lock nuts ½"	.02	.08	
2	Lag bolts. 4" x ½"	.05	.10	
	Estimated Material		115.41	115.41
	LABOR:			
	Trucking, and erecting		11.00	
	Estimated Labor			11.00
	Estimated Material and Labor		126.41	
	Contingencies, miscellaneous and incidentals 5%		6.32	6.32
			132.73	
	OVERHEAD:			
	Engineering, etcetra. ----- 10%		13.27	13.27
	Total estimated cost for farm substation S-8A		146.00	146.00

NOTE: Where a disconnect is not used, deduct $ 14.25 from the above total, leaving ---- $131.75. S-8B

6900 VOLT FARM LINE --- Preliminary Cost Estimate

Light Head Guy --- Drawing # S - 10A

		Unit Cost	Total	
MATERIAL:				
1	Guy fitting - Slater # 6001 or similar.	.26	.26	
1	Lag Bolt 4 x $\frac{1}{2}$"	.05	.05	
2	Guy Clamps - 2 bolt, Slater #7448 or similar	.21	.42	
1	Anchor rod $\frac{1}{2}$ x 6', Slater # 8506 or similar	.67	.67	
1	Expanding anchor, Slater # C-62-H, 5,000 lbs holding power in average soil	1.82	1.82	
40'	Guy wire $\frac{1}{4}$" - 7 strand - (129 lbs./M', minimum breaking strength 3400 lbs.)	13.10/c#	.68	
	Estimated Material		3.90	3.90
LABOR:				
	Staking and clearing Right of Way.		.50	
	Digging, installing, trucking		3.00	
	Estimated Labor			3.50
	Estimated Material and Labor		7.40	
	Contingencies, miscellaneous and incidentals 5%		.37	.37
			7.77	
OVERHEAD:				
	Engineering, etcetra --	10%	.78	.78
	Total Estimate Cost --------		8.55.	8.55

NOTE: Where guy guards are required add $ 1.44 to the above total.

6900 VOLT FARM LINE --- Preliminary Cost Estimate..

Heavy Head Guy --- Drawing # S - 10 B

		Unit Cost	Total	
MATERIAL:				
1	Guy fitting - Slater # 6001 or similar	.26	.26	
1	Lab bolt 4" x ½"	.05	.05	
3	Guy clamps - 2 bolt, Slater #7448 or similar.	.21	.63	
1	Anchor rod, ½" x 6' - double thimble eye, Slater # 8506, or similar	.67	.67	
1	Expanding anchor, Slater #C-834-H· :,or similar (Holding power 9000 lbs. in average soil)	2.23	2.23	
70'	Guy wire - ¼" - 7 strand. Doubled (Minimum breaking strength - 3400 lbs.) 129#/M'	13.10/C#	1.18	
	Estimated Material		5.02	5.02
LABOR:				
	Staking and clearing Right of Way		.50	
	Digging, installing, trucking		3.00	
	Estimated Labor		3.50	3.50
	Estimated Material and Labor.		8.52	
	Contingencies, miscellaneous and incidentals 5%		.43	.43
			8.95	
OVERHEAD:				
	Engineering, drawings, prints, route plans, approvals, purchasing and handling of material, supervision of construction and accounting 10%		.90	.90
	Total estimated cost ----------		9.85	9.85

NOTE:

Where guy guards are required, add $ 1.44 to the above total.

6900 VOLT FARM LINE --- Preliminary Cost Estimate.

Light Overhead, Stub and Guy --- Drawing # S - 10 C

		Unit Cost	Total
MATERIAL:			
1	Double thimble eyenut 5/8". Slater # 22115, similar.	.30	.30
1	Eyebolt 5/8 x 8", Slater #9958, similar	.28	.28
1	Thimble ½", Slater #7594, similar	.07	.07
1	Square washer 2" x 2" x 11/16" hole	.03	.03
1	Guy fitting, Slater #6001, similar	.26	.26
1	Lag bolt ½" x 4"	.05	.05
4	Guy Clamp 2 bolt - Slater #7448, similar	.21	.84
130'	Guy wire ¼" 7 strand - 129#/M'	13.10/c#	1.86
1	Anchor rod ½" x 6' - Slater # 8506 similar.	.67	.67
1	Expanding anchor - Slater #C-62-H, similar	1.82	1.82
1	25' cedar pole, class 6 - butt treated, and roofed, and drilled	6.50	6.50
	Estimated Material	12.68	12.68
LABOR:			
	Staking, and clearing Right of Way	.75	
	Digging, installing, trucking	5.00	
	Estimated Labor		5.75
	Estimated Material and Labor	18.43	
	Contingencies, miscellaneous and incidentals, 5%	.92	.92
		19.35	
OVERHEAD:			
	Engineering, accounting --- 10%	1.94	1.94
	Total Estimated Cost ----	$ 21.29	21.29

NOTE:

Where guy guards are required, add $ 1.44 to the above total.

6900 VOLT FARM LINE --- Preliminary Cost Estimate.

HEAVY OVERHEAD, STUB and GUY --- Drawing # S - 10 D.

		Unit Cost	Total	
MATERIAL:				
1	Double thimble eyenut 5/8", Slater # 22115, similar.	.30	.30	
1	Eyebolt 5/8 x 8", Slater # 9958	.28	.28	
2	Thimble ½", Slater # 7594, similar	.07	.14	
1	Square washer 2" x 2" x 11/16" hole	.03	.03	
1	Guy fitting, Slater # 6001, similar	.26	.26	
1	Lag bolt 4" x ½"	.05	.05	
6	Guy clamp, 2 bolt - Slater # 7448, similar	.21	1.26	
200 '	Guy wire ¼" -7 strand, Doubled 129#/M' 3400 # minimum breaking strength.	13.10/c#	3.38	
1	Anchor rod ½" x 6' double thimble eye, Slater # 8506, similar	.67	.67	
1	Expanding anchor - Slater # C-834-H, similar	2.23	2.23	
1	25' Class 6 cedar pole, butt treated and roofed, and drilled	6.50	6.50	
	Estimated Material		15.10	15.10
LABOR:				
	Staking and clearing Right of Way		.75	
	Digging, installing and trucking.		5.50	
	Estimated Labor			6.25
	Estimated Material and Labor		21.35	
	Contingencies, miscellaneous and incidentals-5%		1.07	1.07
			22.42	
OVERHEAD:				
	Engineering, drawings, prints, route plans, approvals, purchasing and handling material, supervision of construction and accounting... 10%		2.24	2.24
	Total estimated cost ----------		$ 24.66	24.66

NOTE: Where guy guards are required, add $1.44 to the above total.

6900 VOLT FARM LINE — Preliminary Cost Estimate

3 Wire Secondary Span of 150'

Material:					
	30#	#8, D.B.W.P. MHD Copper Wire, 66#/M'	28.60¢#	8.58	
	1	25' Class 6 ASA Pole, Butt treated and roofed	6.00	6.00	
	3	Service Insulator - Slater #190 similar	.21	.63	
					15.21
Labor:					
		Staking & Clearing	1.00		
		Digging Erecting Stringing & Trucking	3.50		
				4.50	
					19.71
		Miscellaneous, contingencies & incidentals 5%		.99	
					20.70
Overhead:					
		Engineering etc. 10%		2.07	
					22.77

Estimated Cost of Secondary Span ... #22.77

6900 VOLT FARM LINE --- Preliminary Cost Estimate

50 Ft. Service With Meter

MATERIAL:				
	3 Service Insulators - Slater #190 similar	.21	.63	
	10# #8 D.B.W.P. Copper Wire M.H.D.	28.60/c#	2.86	
	1 10 Amp, 3 Wire Meter & Type "A" Terminal Box (Meter tested & Tagged)	18.25	18.25	
				21.74
LABOR:				
	Installing & Trucking		2.00	
				23.74
	Contingencies miscellaneous & incidentals 5%		1.19	
				24.93
OVERHEAD:				
	Engineering, construction, supervision etc.	10%	2.49	
				27.42

6900 VOLT FARM LINE — Preliminary Cost Estimate

CONDUCTOR A.C.S.R. SPECIAL

MATERIAL:

1589#	- A.C.S.R. Special - 3 aluminum 4 steel, ultima te strength 6400#, 148.8 pounds per M'-#7 B & S Copper equivalent (Al. Co. Code word "Shrike") (2 miles - 3% = 1589#)	14.96/C#	237.71	
8	Splicing sleeves for "Shrike" (Al. Co. #T44)	.37	2.96	
34	Sets Armor rods (Al. Co. #A 228)	.32	10.88	
70	Ferrules (Al. Co. #K 120)	.03	2.10	
4#	#6 Al tie wire	37.04/C#	1.48	
24'	Al. tape 15#/M'	.40/#	.15	
	Estimated material cost per mile			255.28

LABOR:

	Stringing, armoring, tying and trucking per mile	38.00	
	Estimated Material & Labor		293.28
	Miscellaneous contingencies & incidentals 5%	14.66	
			307.94

OVERHEAD:

	Engineering etc. 10%	30.79	
			$338.73

6900 VOLT FARM LINE — Preliminary Cost Estimate

CONDUCTOR - #6 STEEL

MATERIAL:

1218#	- No. 6 B.W.G. solid steel conductor "Crapo" HTC-80 Indiana Steel & Wire Co. or similar 112#/M' minimum breaking strength of 2589# - special conductivity (2 miles ± 3% of conductor = 1218#)	9.60/C#	116.93	
10#	- No. 8 B.W.G. Iron Wire (for ties)	8.29/C#	.83	
6	- Splicing Sleeves "Nicropress, #5-203S or similar	.27	1.62	
	Estimated Material - - - -			119.38

LABOR:

	Stringing, tying and trucking per mile of line.....	25.00	
			144.38
	Miscellaneous contingencies & incidentals 5% - - - -	7.22	
			151.60

OVERHEAD:

	Engineering etc. 10%	15.16	
	Total Estimated Cost per mile of Line		166.76

6900 VOLT FARM LINE — Preliminary Cost Estimate

CONDUCTOR - #8 STEEL

MATERIAL:

	800 lbs - No. 8 B.W.G. solid steel conductor - "Crapo" HTC-80 Indiana Steel & Wire Co. or similar 74 #/M', min. breaking strength 1711# (2 miles of conductor + 3% = 800#	10.08/C#	80.64	
10	lbs - No. 8 B.W.G. Iron Wire (for ties)	8.29/C#	.83	
6	Splicing Sleeves, Nicropress, #5-165G similar	.26	1.56	
	Estimated Material -----			83.03
LABOR:	Stringing, tying, trucking, per mile of line		25.00	
				108.03
	Miscellaneous contingencies & incidentals 5%		5.40	
				113.43
OVERHEAD:	Engineering etc. 10%		11.34	
	Total estimated cost per mile of line ---			124.77

6900 VOLT FARM LINE — Preliminary Cost Estimate

CONDUCTOR #6A COPPERWELD COPPER

MATERIAL:

1105#	#6A Copperweld - Copper, Ultimate strength 2585# weight 101.6#/M' (2 miles + 3% conductor = 1105#)	25.75/C#	284.54	
6	Splicing Sleeves	.29 ea.	1.74	
10#	#6 Tie Wire	26.55/C#	2.66	
25 ft.	Tinned copper tape (1/2#)	.38	.19	
	Estimated Material Cost per mile of line			289.13

LABOR:

	Stringing, tying & trucking	27.00	
	Estimated Material & Labor ----		316.13
	Miscellaneous contingencies & incidentals 5% --------	15.81	
			331.94

OVERHEAD:

	Engineering etc. 10%	33.19	
	Total estimated cost per mile of line.....		365.13

6900 VOLT FARM LINE — Preliminary Cost Estimate

MAIN SUNSTATION ON EXISTING LINE

MATERIAL:

1	50 KVA, 13200/6900 volt transformer with 3 - 4½% reduced capacity taps, single phase, 60 cycle, with oil	632.92	632.92	
2	Arrester - 15 KV	33.20	66.40	
2	Arrester - 8 KV	14.97	29.94	
2	Disconnecting Switch, 15 KV	13.25	26.50	
2	Disconnecting Switch, 8 KV	11.40	22.80	
4	Fuse Links	.40	1.60	
4	Ground Rods with connectors	1.24	4.96	
1	40' Cedar Pole Class 4 ASA, Butt treated and roofed	13.84	13.84	
	Miscellaneous hardware, timber, wire & insulators for modified platform type substation material		27.00	
	Material			825.96

LABOR:

Digging, assembling, erecting & trucking		40.00	
Labor & Material			865.96
Contingencies miscellaneous & incidentals, 5%		43.30	
			909.26

OVERHEAD:

Engineering, Drawings, Approvals, Purchasing and Handling of Material, Supervision of Construction and Accounting -- 10%	90.93	
Estimated Cost of Substation		$1,000.19

6900 VOLT FARM LINE — Preliminary Cost Estimate

FIRE GUARDS

MATERIAL:		
1 - Fireguard - #20 guage galvanized iron complete with bolts and buts 6' high	7.70	
LABOR:		
Installing and trucking	1.26	
Material & Labor		8.96
Miscellaneous contingencies & incidentals 5%	.45	
		9.41
OVERHEAD:		
Engineering etc. 10%	.94	
Total Estimated Cost.....		10.35

GUY GUARDS

MATERIAL		
2 - 2 x 4 - 8' long, grooved	.42	
6 - Carriage bolts 4 x 3/8"	.18	
6 - Round washers 3/8"	.05	
		.65
LABOR:		
Installing and trucking	.60	
Material & Labor		1.25
Miscellaneous contingencies & incidentals 5%	.06	
		1.31
OVERHEAD:		
Engineering etc. 10%	.13	
		1.44

Add $5.34 if a 40' pole is used in place of a 30' pole at railway crossings.

6900 VOLT FARM LINE — Preliminary Cost Estimate

LIST OF MATERIAL USED IN PRELIMINARY DESIGN

Item No.	Description	Cost (F.O.B.Alta)
1	Cedar Pole, 30' Class 6 A.S.A. - 1/2" Creosote butt treated, roofed and drilled with 2-1/2" holes	7.84
2	Pole top pin, Slater #3034 or similar with 9/16" holes	.79
3	Neutral bracket, Slater #4480 or similar	.29
4	Machine bolt 1/2" x 8" galvanized	.09
5	Machine bolt 1/2" x 10" galvanized	.11
6	Eyebolt 5/8 x 8" galvanized	.28
7	Eyebolt 5/8 x 10" "	.33
8	Square washer 2" x 2" x 9/16" hole	.03
9	" " 2" x 2" x 11/16" hole	.03
10	Pal or lock nuts 1/2" galvanized	.02
11	Lag bolt 1/2" x 4"	.05
12	Eyenut - double thimble 5/8", Slater #22115 or similar	.30
13	Thimble 3/8" galvanized	.05
14	Thimble 1/2" galvanized Slater #7594 or similar	.07
15	Guy fitting - Slater #5001 or similar	.26
16	Guy clamp, 2-bolt, Slater #7448 or similar	.21
17	Anchor rod, 1/2" x 6', double thimble eye- Slater #8506 similar	.67
18	Expanding anchor, Slater C-62-H or similar (5000# holding power in average soil)	1.82
19	Expanding anchor, Slater C-834-H or similar (9000# holding power in average soil)	2.23
20	Ground rod iron 3/4" x 8' Slater #9338 -C or similar	1.24
21	Ground wire guard - 2" x 4" x 8' fir-grooved	.30
22	Guy guard 2 pcs. 2" x 4"x8' grooved & bolted with 6 - 3/8" x 4" galvanized carriage bolts & 6 round washers	.65
23	Staples 1 1/2" or 2" galvanized	
24	Wire Connectors for #6 B.W.G. steel - Kearney #6885 or similar	.16
25	Wire Connector for #4 Copper Burndy Servit #KS20 or similar	.21
26	Lightning arrester - CLM 305063 - 53 or similar	14.97
27	Disconnecting switch (tripout) Kearney #9000 similar....	11.40
28	Fire guard - #20 galvanized iron 6' high complete with bolts & nuts	7.70
29	Insulator suspension type C.P. #8080 or similar	1.71
30	Insulator pin type C.P. #505 or similar	.18
31	Insulator service type Slater #190 or similar	.21
32	Guy wire - 1/4" - 7 strand, 3400# Breaking strength 129#/M'.....	13.10/C#
33	#6 B.W.G. Steel wire, solid - "Crapo" HTC-80 Indiana Steel and Wire Co. or similar, 112#/M' 2589# min. strength ..... Special Conductivity	9.60/C#
34	#8 B.W.G. Steel wire, solid "Crapo" HTC 80 Indiana Steel and Wire Co. or similar 74#/M' 1711# min. strength..., special conductivity	10.08/C#

6900 VOLT FARM LINE — Preliminary Cost Estimate

LIST OF MATERIAL USED IN PRELIMINARY DESIGN

cont'd

Item No.	Description	Cost (F.O.B. Alberta)
35	#6A Copperweld Copper Conductor 101.6#/M', Min. strength 2585# conductivity = #6 copper	25.75/C#
36	A.C.S.R. Special Conductor - Al. Co. Code word "Shrike" Min strength 6400#, 148.8#/M' conductivity = #7 B & S Copper	14.96/C#
37	#6 Copper tie wire bare S.D.	26.55/C#
38	#8 Iron tie wire galvanized 74#/M'	8.29/C#
39	Splicing Sleeves for "Shrike" A.C.S.R. Al. Co. #E44	.37
40	Splicing Sleeves for 6A Copperweld copper	.29
41	Splicing Sleeve for #6 B.W.G. steel-nicropress	5-203-S 27
42	Splicing Sleeve for #8 B.W.G. steel nicropress	5-165-G 26
43	#6 Aluminum tie wire	37.04/C#
44	Aluminum tape 15#/M'	.40/#
45	Set of Armor rods Al. Co. # A228	.32
46	Aluminum ferrules Al. Co. #K 120	.03
47	Transformer 1 1/2 KVA, 6900/230/115 volt Molomey Pivot type or similar	81.55
48	Fuse link Kearney 6413-2 similar	.40
49	Machine bolt 5/8 x 10" galvanized	.15
50	Hot line clamp Kearney #3517-4	.97
51	25' Cedar pole butt treated roofed & drilled	Class 6 6.50
52	35' Cedar pole butt treated roofed & drilled	" " 9.57
53	40' Cedar pole butt treated roofed & drilled	" "11.66

2. Typical Cost Estimates for Surveyed Areas.

6900 VOLT FARM LINE — Preliminary Cost Estimate

SUMMARY OF COST

NOTES

1. Existing lines in the surveyed area and new lines necessary to bring the current to the borders of the area have not been taken into consideration for the purposes of the estimates. This was thought advisable in order to make the estimates more generally applicable.

2. Preliminary customer survey expenses and expenses in connection with final customer contacts, registration of the right of way surveys and legal expense in this connection have not been included in the estimates.

3. It has been assumed that all easement will be provided byhthe land owners.

4. The lines included in the preliminary estimates have been designed to permit an average demand of 500 watts per customer - or a maximum individual demandof 2 to 3 H.P. with a voltage regulation within 10%.

5. For the purposes of this survey, all farms classified as 'good' and one half of those classified as 'fair' that could be reached by 1 1/2 miles of line or less have been considered as taking service. Those 'fair' required to make up the 50% have been taken from the ones most economically reached.

6. The cost estimates were based on construction being completed in favourable weather.

7. The customer's wiring has not been included and if outdoor metering is required it is assumed that this will be added to the customer's cost. The estimates provided for service wires to the residence and an inside meter only.

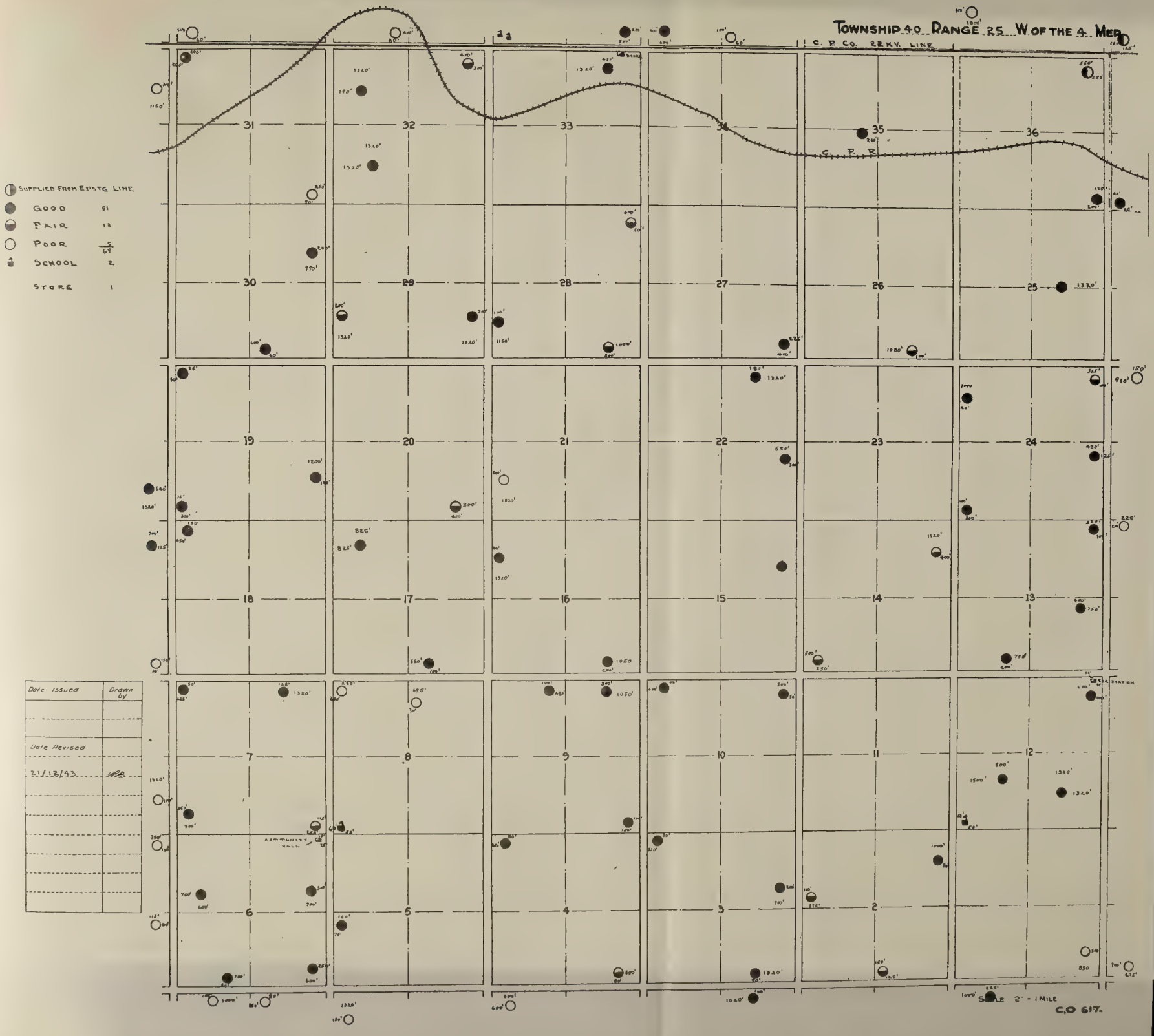
8. The provision of service to hamlets and villages in the area surveyed has not been taken into consideration.

9. Such small savings as could be obtained by supplying more than one service from a single substation have not been taken into account. Farms already taking service from existing lines were considered as good prospects for the purposes of the estimate.

10. The conductor used on road allowances is #6 B.W.G. steel or better, and that for individual taps is #8 B.W.G. steel.

11. The estimates have been based on present prices of labor and materials.

NEAR CLIVE


TOWNSHIP 40 RANGE 25 W OF THE 4 MER
C. P. CO. 22 KV. LINE
C. P. R.
SUPPLIED FROM EXISTG. LINE
GOOD 51
FAIR 13
POOR 5/69
SCHOOL 2
STORE 1
Date Issued
Drawn by
Date Revised
31/12/43
SCALE 2" - 1 MILE
C.O 617.

6900 VOLT FARM LINE — Preliminary Cost Estimate

CLIVE AREA TWP. 40 RG. 25 W4th

(One township and fringe)

Quantity	Description	Detail Sheet No.	Drawing No.	Unit Cost	Total Cost
687	Tangent Structures	1.	S-1	16.69	11466.03
62	Additional grounds on tangent structures	1	S-1A	1.97	122.14
46	Single Dead end structures	2	S-2A	19.38	891.48
8	Right angle structures	3	S-2B	23.53	188.24
6	Double pin structures	4	S-4	18.71	112.26
27	Tap, with disconnects, on existing structure.....	6	S-5A	19.22	518.94
12	Tap, without disconnects, on existing structure.....	5	S-5B	5.96	71.52
18	Addition for tap on property side	5		1.00	18.00
38	Farm Substation, with disc, on existing str.	7	S-8A	146.00	5548.00
27	Farm Substation without disc, on existing str.....	7	S-8B	131.75	3557.25
47	Light head guy	8	S-10A	8.55	401.85
31	Heavy head guy	9	S-10B	9.85	305.35
13	Light overhead, stub and guy	10	S-10C	21.29	276.77
11	Heavy " " " "	11	S-10D	24.66	271.26
29	Secondary Spans, 3 Wire, 150'	12		22.77	660.33
65	Service, with meter, 50'	13		27.42	1782.30
65	Shares of Main Substation (65/100 of $1000).....	18		10.00	650.00
5.04	Miles of #6A Copperweld Copper Conductor Line	17		365.13	1840.26
33.85	Miles of #6 Steel Conductor Line	15		166.76	5644.83
3.23	Miles of #8 Steel " Line.....	16		124.77	403.01
26	Additional for changing tangent to double pin str.....	4-1		2.02	52.52
13	Additional for changing tangent to large angle str.....	2-1		2.69	34.97
7	Additional light head guys..	8	S-10A	8.55	59.85
13	" heavy " "	9	S-10B	9.85	128.05
77	" for changing 30' to 35' pole	1		2.75	211.75
6	Additional for changing 30' to 40' (R.R. Xing)	19		5.34	32.04
6	Fireguards at R.R. Crossing	19		10.35	62.10
65	Guyguards (1 per Customer)	19		1.44	93.60
	Total				$35,404.70

6900 VOLT FARM LINE — Preliminary Cost Estimate

DISTRICT — CLIVE AREA — TWP. 40 RG. 25 W 4TH.

(One township and fringe)

CUSTOMER CLASSIFICATION

	Number.	% of Total	No. Supplied	% of Tot. Supp.
Good	59	63.4	58	
Fair	13	14.0	7	
Poor	21	22.6	0	
TOTAL	93	100.0	65	69.9

SERVICES (Transformer to Customer)

Number	Cost	Cost per service
65	$11,932.63	$183.58

LINE (All Line & Taps)

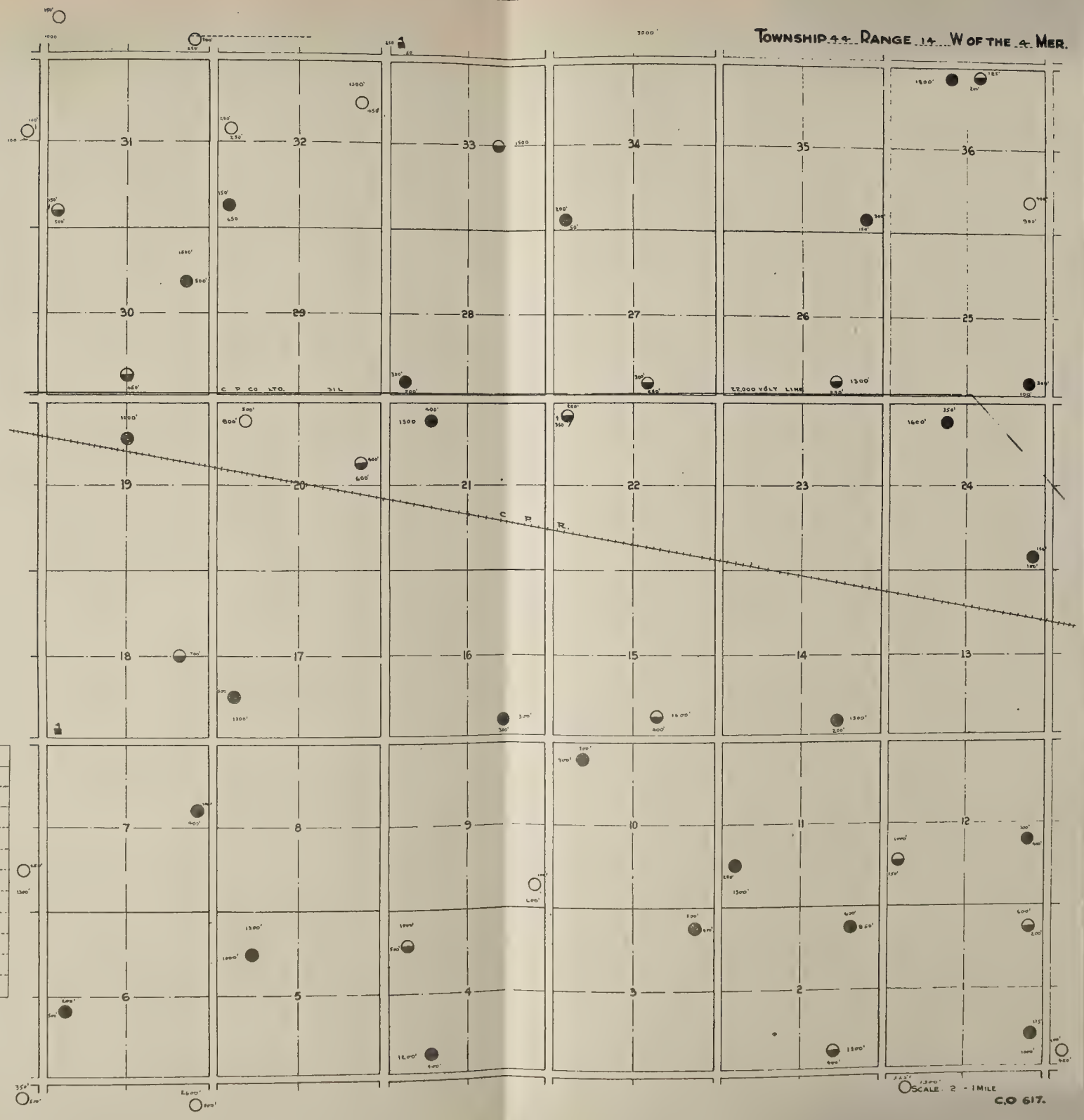
Miles	Cost	Cost per Mile
42.12	$22,822.07	541.84

TOTAL COST

Total	Cost per Customer	Cost per Unit Area (1/4 sections) (196)
$35,404.70	$544.69	$180.64

KILLAM – STROME

TOWNSHIP 44 RANGE 14 W OF THE 4 MER.



GOOD 24

FAIR 14

POOR 5 TOTAL 43

SCHOOL

Date Issued	Drawn by
Date Revised	
2-2/13-43	GKS

SCALE 2 - 1 MILE

C.O 617.

6900 VOLT FARM LINE — Preliminary Cost Estimate

KILLAM - STROME AREA — TP. 44, RANGE 14, W4th MER.

One township and fringe

Quantity	Description	Detail Sheet No.	Drawing No.	Unit Cost	Total Cost
470	Tangent Structures	1	S - 1	16.69	7844.30
41	Additional Grounds on tangent structures.....	1	S-1A	1.97	80.77
38	Single Dead-end Structures	2	S-2A	19.38	736.44
3	Right angle structures	3	S-2B	23.53	70.59
2	Double pin structures	4	S-4	18.71	37.41
24	Tap, with disconnects, on existing structure	6	S-5A	19.22	461.28
10	Tap, without disconnects, on existing structure	5	S-5B	5.96	59.60
10	Addition for tap on property side	5		1.00	10.00
8	Farm Substation, with discs, on existing structure.....	7	S-8A	146.00	1168.00
24	Farm Substation, without discs, on existing structures,	7	S-8B	131.75	3162.00
39	Light head guy	8	S-10A	8.55	333.45
18	Heavy head guy	9	S-10B	9.85	177.30
9	Light Overhead, stub and guy	10	S-10C	21.29	191.61
8	Heavy Overhead, stub and guy	11	S-10D	24.66	197.28
7	Secondary Spans, 3 wire, 150 ft.	12		22.77	159.39
32	Service with meter, 50 ft.	13		27.42	877.44
32	Shares of main substation (32/100 of $1000.00)	18		10.00	320.00
___	Miles of 6A Copperweld Copper Conductor Line	17		365.13	___
26.51	Miles of #6 Steel Conductor Line	15		166.76	4420.80
1.79	Miles of #8 Steel Conductor Line	16		124.77	223.34
12	Additional for Changing tangents to double pin str.....	4-1		2.02	24.24
6	Additional for changing tangents to large angle str.....	2-1		2.69	16.14
6	Additional light head guys	8	S-10A	8.55	51.30
6	Additional heavy head guys	9	S-10B	9.85	59.10
52	Additional for changing 30' to 35' poles	1		2.75	143.00
2	Additional for changing 30' to 40' poles (R.R. Xing)....	19		5.34	10.68
2	Fireguards at R. R. Crossings.	19		10.35	20.70
32	Guy Guards (1 per Customer)	19		1.44	46.08
	TOTAL - - - - -				$20,902,24

6900 VOLT FARM LINE — Preliminary Cost Estimate

KILLAM - STROME AREA — TP. 44, RANGE 14, W4th MER.

One township and fringe

Customer Classification

	Number	% of Total	No. Supplied	% of Total Supplied
Good	25	48	25	
Fair	14	27	7	
Poor	13	25	0	
Total	52	100	32	62

Services (Transformer to customer including customer's substations)

Number	Cost	Cost Per Service
32	$5708.83	178.40

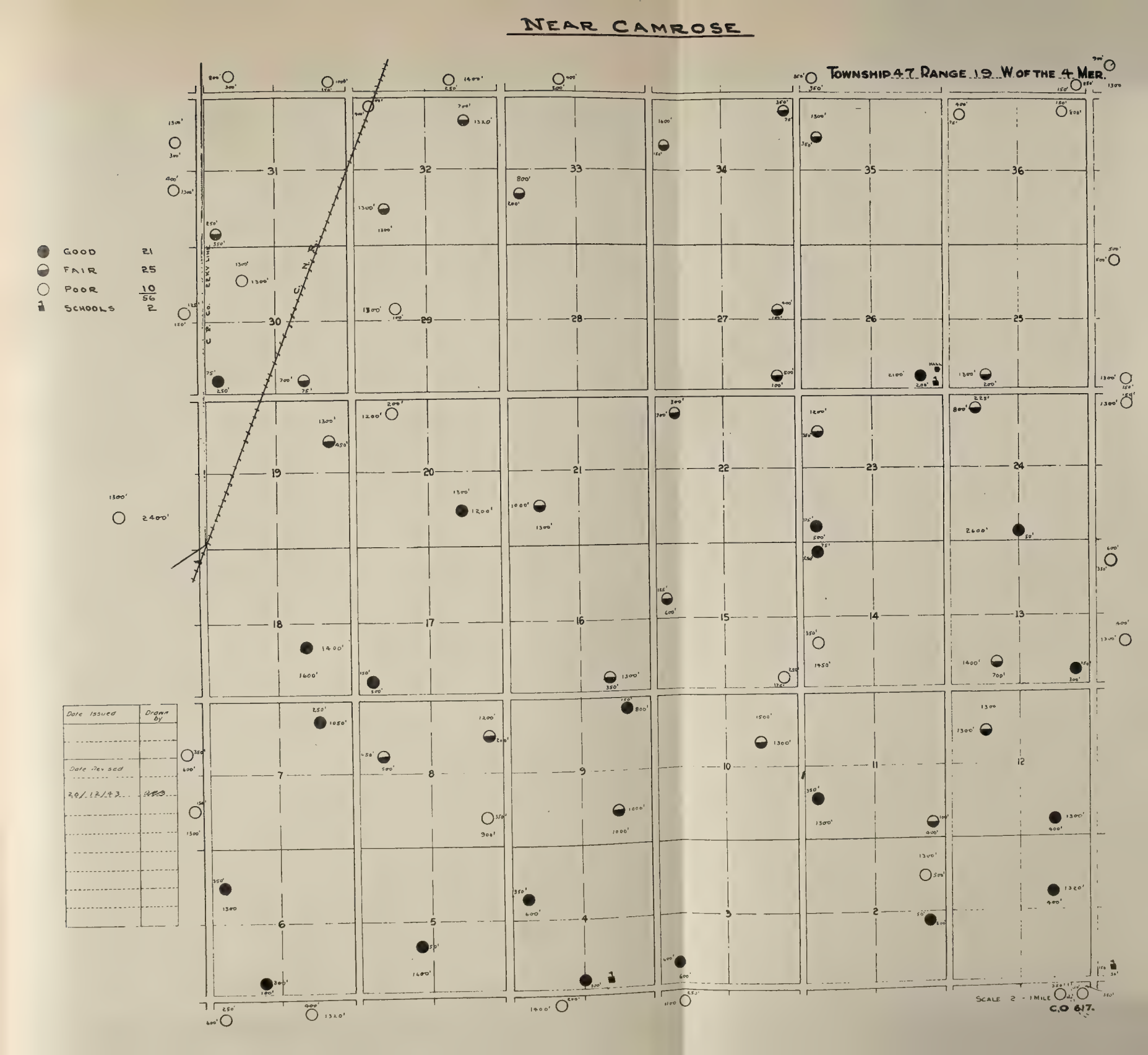
Line (All lines and taps)

Miles	Cost	Cost Per Mile
28.3	$14,873.41	$525.56

Total Cost

Total Cost	Cost Per Customer	Cost per Unit Area (196-1/4 sections)
$20,902.24	$653.20	$106.64

NEAR CAMROSE



6900 VOLT FARM LINE — Preliminary Cost Estimate

DISTRICT — CAMROSE AREA — TWP. 47 RG. 19 W 4th

(one township and fringe)

CUSTOMER CLASSIFICATION

	Number	% of Total	No. Supplied	% of Tot. Supp.
Good	21	26.3	21	
Fair	25	31.2	13	
Poor	34	42.5	0	
TOTAL	80	100.0	34	42.5

SERVICES (Transformer to Customer)

Number	Cost	Cost per Service
34	$6055.67	$178.11

LINE (All line and taps)

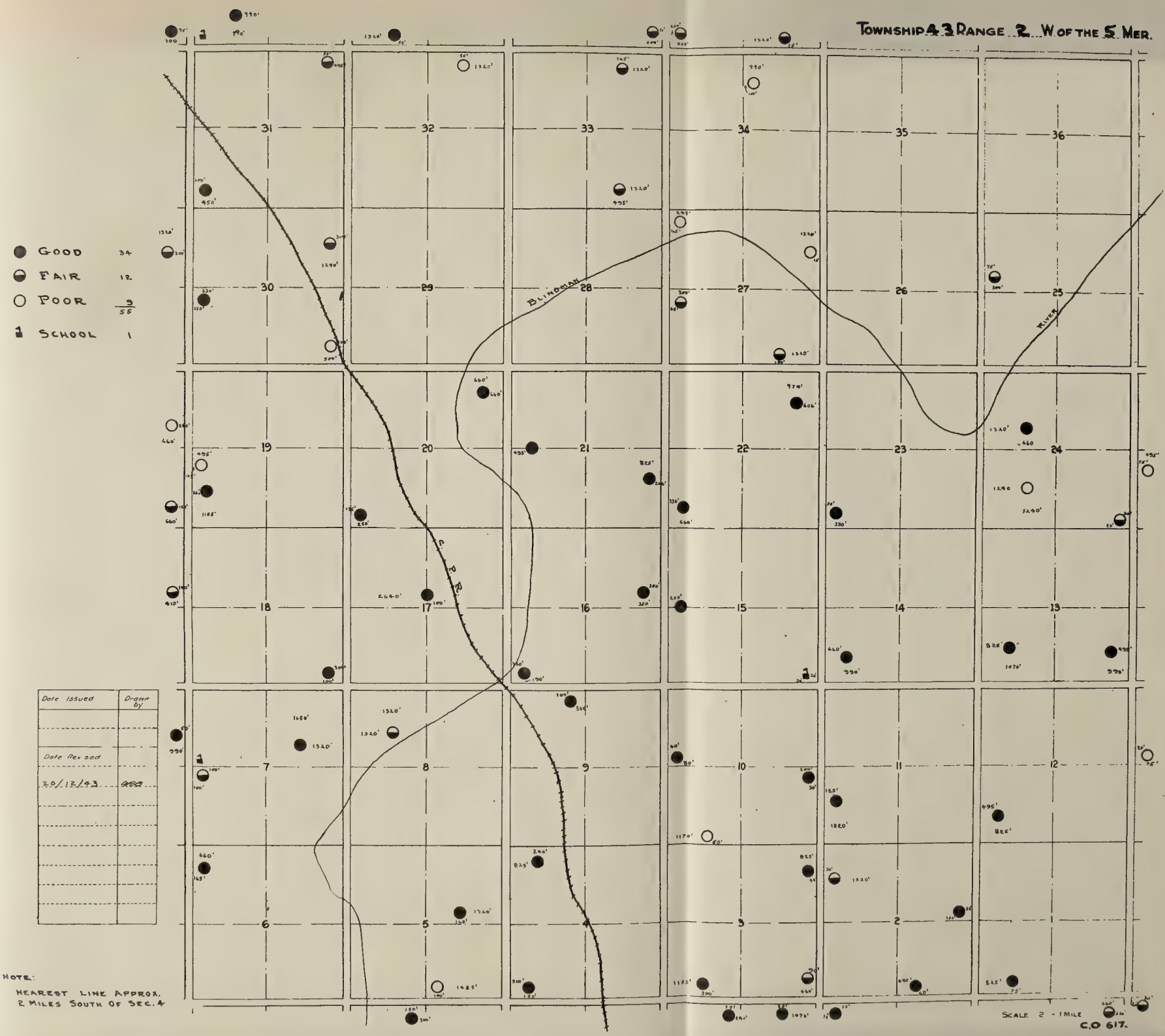
Miles	Cost	Cost per Mile
28.06	14,562.42	518.97

TOTAL COST

Total	Cost per Customer	Cost per Unit Area (1/4 Sections - 196)
$20,958.09	616.42	$106.92

NEAR RIMBEY

TOWNSHIP 43 RANGE 2 W OF THE 5 MER.



NOTE:

NEAREST LINE APPROX. 2 MILES SOUTH OF SEC. 4

6900 VOLTS FARM LINE — Preliminary Cost Estimate

RIMBEY AREA - TOWNSHIP 43 RANGE 2 W. of 5TH M

(One Township & Fringe)

Quantity	Description	Detail Sheet No	Drawing No.	Unit Cost	Total Cost
466	Tangent Structures	1	S-1	16.69	7,777.54
35	Additional Grounds on Tangent structures	1	S-1A	1.97	68.95
24	Single dead end structures	2	S-2A	19.38	465.12
7	Right Angle Structures	3	S-2B	23.53	164.71
12	Double Pin Structures	4	S-4	18.71	224.52
15	Tap Without Disconnect on existing pole	5	S-5B	5.96	89.40
11	Addition for tap on property side	5		1.00	11.00
51	Farm Substation on existing Structure...	7	S-8A	146.00	7,446.00
35	Light Head Guy	8	S-10A	8.55	299.25
15	Heavy Head Guy	9	S-10B	9.85	147.75
19	Light Overhead, stub & guy	10	S-10C	21.29	404.51
7	Heavy Overhead, stub & guy	11	S-10C	24.66	172.62
25	Secondary Spans, 3 wire, 150'	12		22.77	569.25
51	Service With Meter 50'	13		27.42	1,398.42
51	Shares of Main Substation 51/100 of $1,000.00	10		10.00	510.00
4.5	Miles of 6A Copperweld Copper Conductor	17		365.13	1,643.09
23.1	Miles of #6 Steel Conductor	15		166.76	3,852.16
3.4	Miles of #8 Steel Conductor	16		124.77	424.22
20	Additional for changing the tangent to double pin structure	4-1		2.02	40.40
10	Additional for changing the tangent to large angle structure	2-1		2.69	26.90
5	Additional light head guys	8	S-10A	8.55	42.75
10	" heavy " "	9	S-10B	9.85	98.50
32	" for changing 30' to 35' poles	1		2.75	88.00
8	Additional for Changing 30' to 40' poles at R.R. X-ing	19		5.34	42.72
6	Fire Guards at R.R. Crossing	19		10.35	62.10
51	Guy Guards (1 per Customer)	19		1.44	73.44
	TOTAL				26,143.32

6900 VOLTS FARM LINE — Preliminary Estimate

District: RIMBEY AREA - TWP . 43 RG. 2 W of 5th

(One township & fringe)

Customer Classification:

	Number	% of Total	No. Supplied	% of Total Supp.
Good	42	56.8	41	
Fair	20	27	10	
Poor	12	16.2	0	
Total.....	74	100	51	69

Services: (Transformer to Customer including the customer's substation)

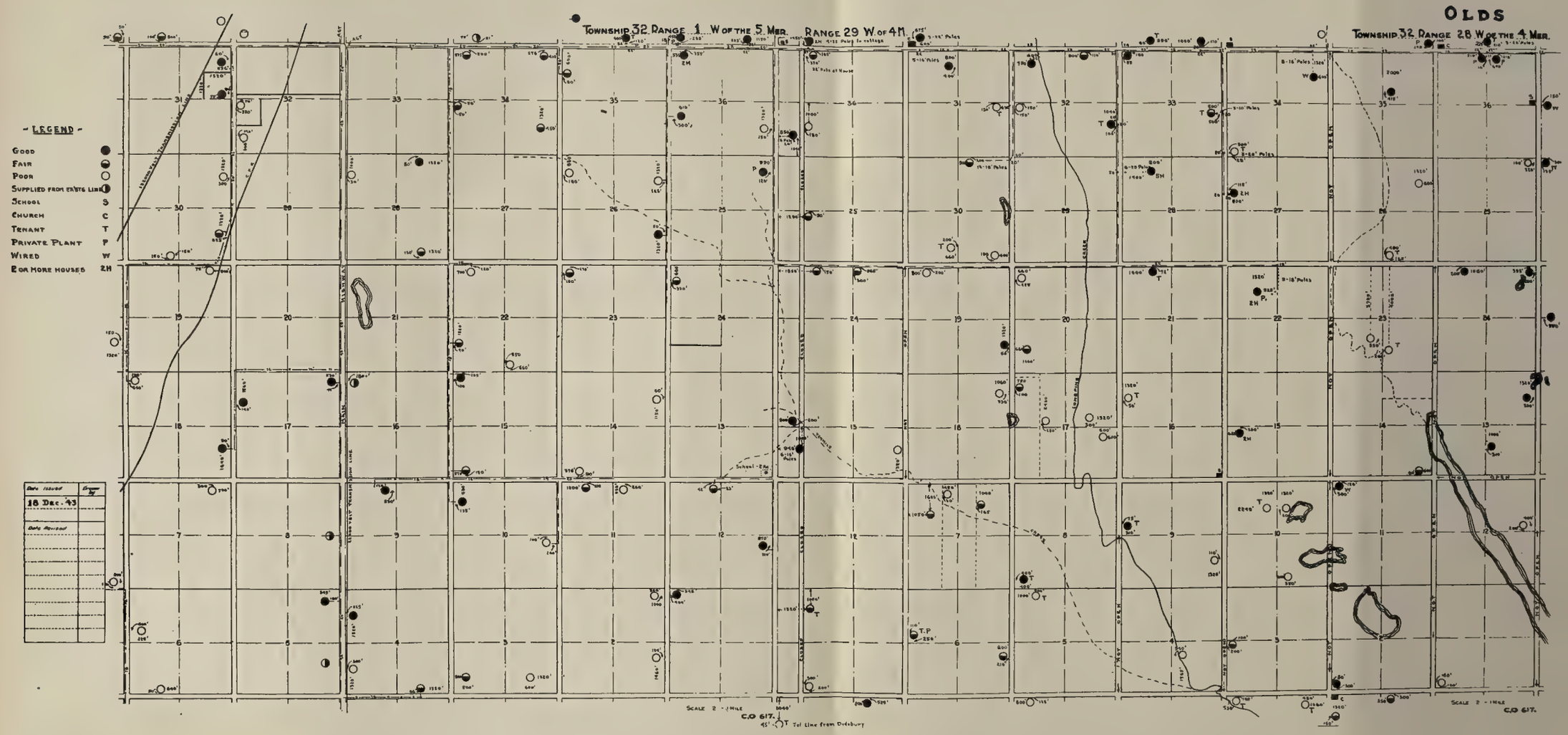
Number	Cost	Cost per Service
51	$9413.67	$184.58

Line: All line & Taps

Miles	Cost	Cost per Mile
31	$16,219.65	$523.21

Total Cost:

Total Cost	Cost per Customer	Cost per Unit Area (196-1/4 sections)
$26,143.32	$512.61	$133.38


OLDS
Township 32 Range 1 W of the 5 Mer.
Range 29 W of 4M
Township 32 Range 28 W of the 4 Mer.
- LEGEND -
Good
Fair
Poor
Supplied from estate line
School S
Church C
Tenant T
Private Plant P
Wired W
8 or more houses 2H
Date Issued 18 Dec. 43
Scale 2 - 1 Mile
C.O 617.
Tel Line from Didsbury

6900 VOLT FARM LINE — Preliminary Cost Estimate

OLDS AREA — TWP. 32 RG. 1 W 5th; " 32 RG. 29 W 4th; " 32 RG. 28 W 4th.

(Two townships, 7 1/2 sections and fringe)

Quantity	Description	Detail Sheet No.	Drawing No.	Unit Cost	Total Cost
884	Tangent Structures	1	S-1	16.69	14,753.96
84	Additional grounds on tangent structures	1	S-1A	1.97	165.48
55	Single dead end structures	2	S-2A	19.38	1,065.90
7	Right angle structures	3	S-2B	23.53	164.71
2	Double pin structures	4	S-4	18.71	37.42
31	Tap, with disconnects, on existing structure	6	S-5A	19.22	595.82
15	Tap without disconnects, on existing structure.....	5	S-5B	5.96	89.40
16	Addition for tap on property side	5		1.00	16.00
43	Farm substation, with disc, on existing str.....	7	S-8A	146.00	6,278.00
31	Farm substation, without disc, on existing str.....	7	S-8B	131.75	4,084.25
63	Light head guy	8	S-10A	8.55	538.65
30	Heavy " "	9	S-10B	9.83	295.50
16	Light overhead, stub and guy	10	S-10C	21.29	340.64
37	Secondary Spans, 3 wire, 150'	12		22.77	842.49
6	Heavy overhead, stub and guy	11	S-10D	24.66	147.96
75	Service, with meter, 50'	13		27.42	2,056.50
75	Shares of Main substation (75/100 of $1000)	18		10.00	750.00
7.33	Miles of #6A Copperweld Copper Conductor line.....	17		365.13	2,676.40
42.17	Miles of #6 Steel Conductor Line.....	15		166.76	7,032.27
4.42	Miles of #8 Steel Conductor Line.....	16		124.77	551.48
30	Additional for changing tangent to double pin str.....	4-1		2.02	60.60
16	Additional for changing tangent to large angle str.....	2-1		2.69	43.04
8	Additional light head guys	8	S-10A	8.55	68.40
16	" heavy " "	9	S-10B	9.85	157.60
96	" for changing 30' to 35' pole....	1		2.75	264.00
2	Additional for changing 30' to 40' pole (R.R. Xing)	19		5.34	10.68
2	Fireguards at R.R. Crossing	19		10.35	20.70
75	Guyguards (1 per customer)	19		1.44	108.00
	TOTAL				$43,215.85

6900 VOLT FARM LINE — Preliminary Cost Estimate

District: OLDS AREA — TWP. 32 RG 1 W 5th; TWP. 32 RG 29 W 4th; TWP. 32 RG 28 W 4th

(Two townships, 7 1/2 sections and fringe)

Customer Classification

	Number	% of Total	No. Supplied	% of Tot. Supp.
Good	60	38.5	58	
Fair	35	22.4	17	
Poor	61	39.1	0	
Total	156	100.0	75	48.0

Services (Transformer to Customer)

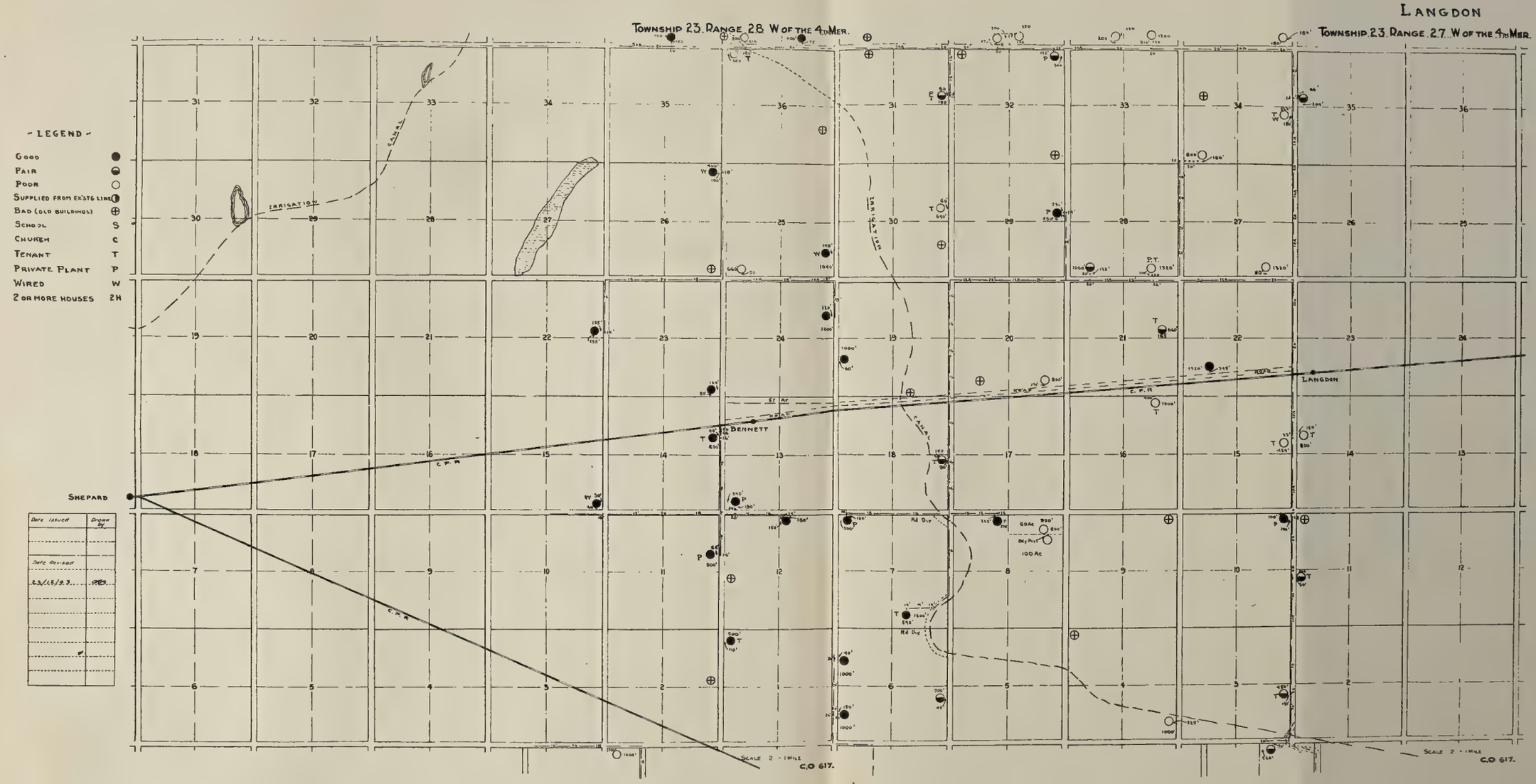
Number	Cost	Cost per Service
75	$13,848.99	$184.65

Line (All Line and Taps)

Miles	Cost	Cost per Mile
53.92	$28,616.86	$530.73

Total Cost

Total	Cost per Customer	Cost per Unit Area (399 1/4 sections)
$43.215.85	$576.21	$108.31


LANGDON
TOWNSHIP 23 RANGE 28 W OF THE 4TH MER.
TOWNSHIP 23 RANGE 27 W OF THE 4TH MER.
- LEGEND -
GOOD
FAIR
POOR
SUPPLIED FROM EX'STG LINE
BAD (OLD BUILDINGS)
SCHOOL S
CHURCH C
TENANT T
PRIVATE PLANT P
WIRED W
2 OR MORE HOUSES 2H
IRRIGATION
BENNETT
LANGDON
SHEPARD
C. P. R.
Date Issued
Drawn By
Date Revised
63/12/9 7...
SCALE 2 - 1 MILE
C.O 617.

6900 VOLT . FARM LINE — Preliminary Cost Estimate

LANGDON AREA — Part TWP. 23 Rg. 28 W 4th & " " 23 " 27 W 4th

(Equivalent to one township & fringe)

Quantity		Detail Sheet No	Drawing No.	Unit Cost	Total Cost
382	Tangent Structures	1	S-1	16.69	6375.58
37	Additional grounds on tangent structures.....	1	S-1A	1.97	72.89
18	Single Dead end Structures	2	S-2A	19.38	348.84
6	Right angle structures	3	S-2B	23.53	141.18
7	Double pin structures	4	S-4	18.71	130.97
14	Tap, without disconnect, on existing structure....	5	S-5B	5.96	83.44
2	Addition for tap on property side	5		1.00	2.00
26	Farm substation, with disc, on existing str.....	7	S-8A	146.00	3796.00
35	Light head guy	8	S-10A	8.55	299.25
19	Heavy " "	9	S-10B	9.85	187.15
17	Light Overhead, Stub & guy	10	S-10C	21.29	361.93
4	Heavy " " "	11	S-10D	24.66	98.64
16	Secondary Spans, 3 Wire, 150'	12		22.77	364.32
26	Service, with meter, 50'	13		27.42	712.92
26	Shares of Main substation (26/100 of $1000)	18		10.00	260.00
40	Miles of #6A Copperweld Copper Conductor Line	17		365.13	1460.52
17.92	Miles of #6 Steel Conductor Line	15		166.76	2988.34
1.46	" " #8 " " "	16		124.77	182.16
11	Additional for Changing tangent to double pin str.....	4-1		2.02	22.22
6	Additional for changing tangent to large angle str.....	2-1		2.69	16.14
3	Additional light head guys	8	S-10A	8.55	25.65
6	" heavy " "	9	S-10B	9.85	59.10
53	" for changing 30' to 35' pole	1		2.75	145.75
2	Additional for changing 30' to 40' pole (R.R. etc.)	19		5.34	10.68
26	Guy Guards (1 Per Customer)	19		1.44	37.44
2	Fire Guards (at R.R. Xing)	19		10.35	20.70

Total $18,203.81

6900 VOLT FARM LINE — Preliminary Cost Estimate

District — LANGDON AREA — Part TWP. 23 Rg. 28 W 4th & " TWP. 23 Rg. 27 W 4th

(Equivalent to one township and fringe)

Customer Classification

	Number	% of Total	No. Supplied	% of Total Supp.
Good	22	32.4	21	
Fair	10	14.6	5	
Poor	36	53.0	0	
Total	68	100.0	26	38.3

Services (Transformer to Customer)

Number	Cost	Cost per Service
26	$4873.24	$187.43

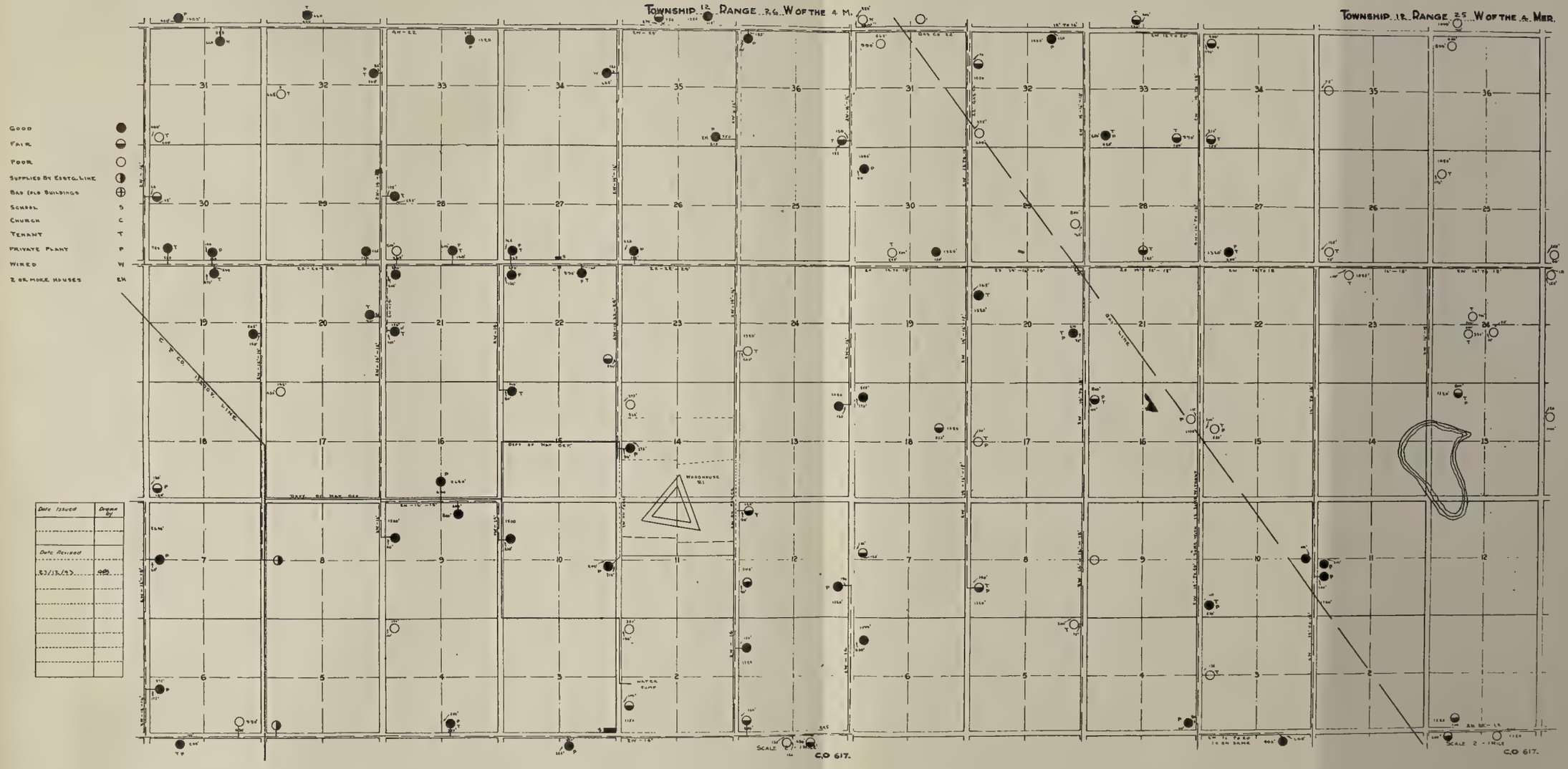
Line (All Line and Taps)

Miles	Cost	Cost per [illegible]
23.38	$13,070.57	$559.05

Total Cost

Total	Cost per Customer	Cost per Unit Area (1/4 sections -196)
$18,203.81	$700.15	$92.88

CLARESHOLM


Township 12 Range 26 W of the 4 M.
Township 12 Range 25 W of the 4 Mer.
Good
Fair
Poor
Supplied By Estd. Line
Bad (old Buildings
School S
Church C
Tenant T
Private Plant P
Wired W
2 or More Houses 2H
C N W Co. Transm. Line
Dept of Nat Res
Woodhouse
Water Pump
Gas Co Line
Date Issued
Drawn By
Date Revised
3/13/43
Scale 2 - 1 Mile
C.O 617.

6900 VOLT FARM LINE — Preliminary Cost Estimate

CLARESHOLM AREA — TWP. 12 Rg. 26 W 4th M
TWP. 12 Rg. 25 W 4th M

(Two townships & fringe)

Quantity	Description	Detail Sheet No.	Drawing No.	Unit Cost	Total Cost
848	Tangent Structures	1	S-1	16.69	14153.12
86	Additional grounds on tangent Structures	1	S-1A	1.97	169.42
43	Single dead end structures	2	S-2A	19.38	833.34
8	Right angle structures	3	S-2B	23.53	188.24
18	Tap, with disconnects, on existing structure	6	S-5A	19.22	345.96
14	Tap, without disconnects, on existing structure	5	S-5B	5.96	83.44
14	Addition for tap on property side	5		1.00	14.00
49	Farm substation, with disc, on existing str...	7	S-8A	146.00	7154.00
18	Farm substation, without disc, on existing str..	7	S-8B	131.75	2371.50
31	Light head guy	8	S-10A	8.55	265.05
37	Heavy Head Guy	9	S-10B	9.85	364.45
8	Light overhead, stub & guy	10	S-10C	21.29	170.32
12	Heavy " " " "	11	S-10D	24.66	295.92
45	Secondary Spans, 3 wire, 150'	12		22.77	1024.65
67	Service, with meter, 50'	13		27.42	1837.14
67	Shares of Main Substation (67/100 of $1000)	18		10.00	670.00
607	Miles of #6A Copperweld Copper Conductor line	17		365.13	2216.34
45.30	Miles of #6 Steel Conductor Line	15		166.76	7554.23
1.61	Miles of #8 " " "	16		124.77	200.88
27	Additional for Changing tangent to double pin str.	4-1		2.02	54.54
14	Additional for Changing tangent to large angle str.	2-1		2.69	37.66
7	Additional light head guys	8	S-10A	8.55	59.85
14	" heavy " "	9	S-10B	9.85	137.90
107	" for changing 30' to 35' pole	1		2.75	294.25
67	Guy Guards (1 per customer)	19		1.44	96.48
	Total				$40,592.68

6900 VOLT FARM LINE — Preliminary Cost Estimate

District: CLARESHOLM AREA — TWP. 12 RG 26 W4th & TWP. 12 RG 25 W 4th

(Two townships and fringe)

Customer Classification

	Number	% of Total	No. Supplied	% of Tot. Supp.
Good	55	48.6	55	
Fair	23	20.4	12	
Poor	35	31.0	0	
Total	113	100.0	67	59.2

Services (Transformer to Customer)

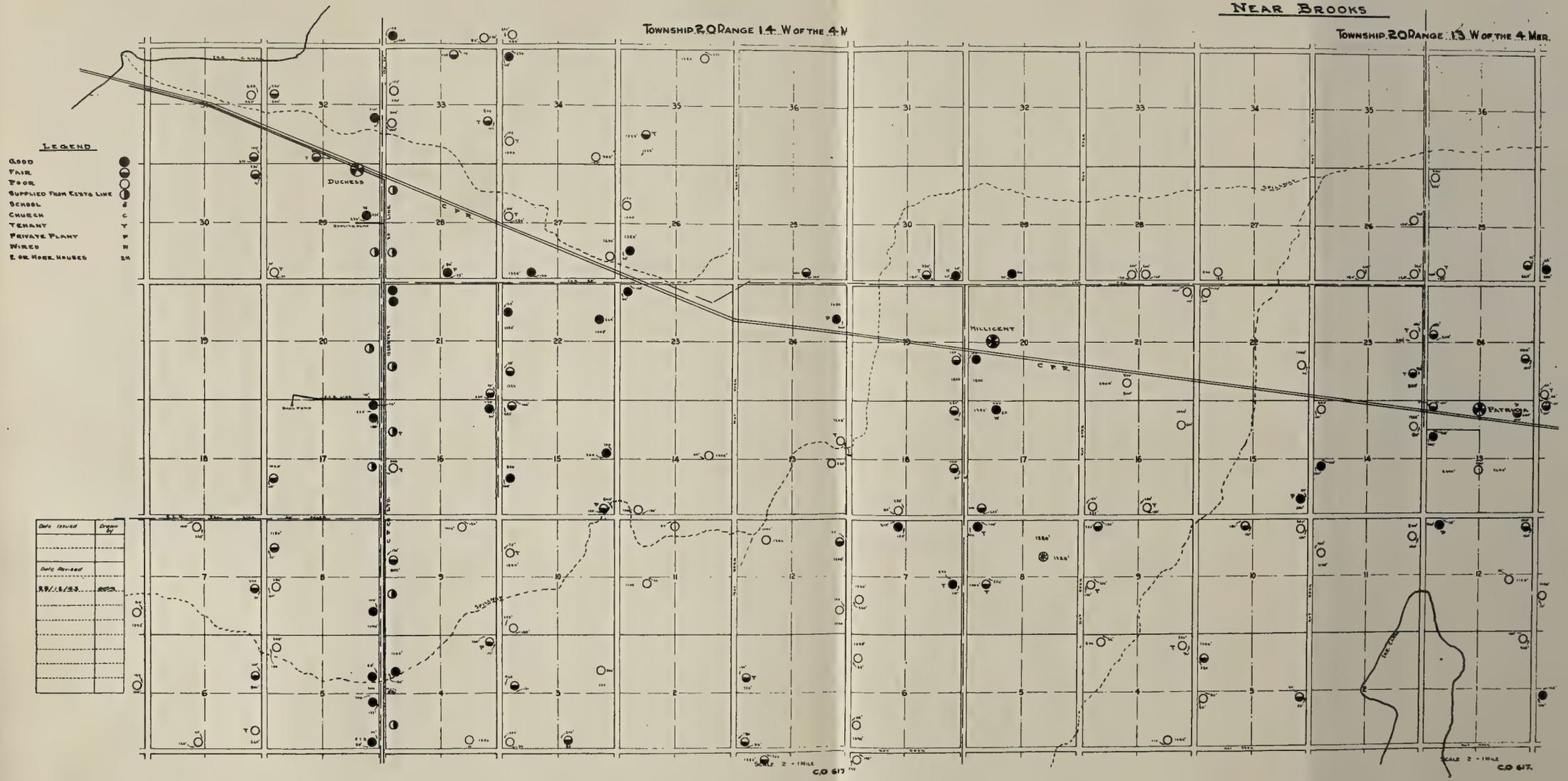
Number	Cost	Cost per Service
67	$12,643.79	$188.71

Line (All Line and Taps)

Miles	Cost	Cost per Mile
52.98	$27,278.89	$514.89

Total Cost

Total	Cost per Customer	Cost per Unit Area (1/4 sections-364)
$40,592.68	$605.86	$111.52


NEAR BROOKS
TOWNSHIP 20 RANGE 14 W OF THE 4 M
TOWNSHIP 20 RANGE 13 W OF THE 4 MER.
LEGEND
GOOD
FAIR
POOR
SUPPLIED FROM ELECTRO LINE
SCHOOL
CHURCH
TENANT
PRIVATE PLANT
WIRED
E. OR HOUSES
DUCHESS
MILLICENT
PATRICIA
SPILLWAY
C.P.R.
SCALE 2 - 1 MILE
C.O 617
Date Issued
Drawn by
Date Revised
29/12/23

6900 VOLT FARM LINE — Preliminary Cost Estimate

BROOKS AREA — TWP. 20 R. - 14 W of 4th
TWP. 20 R - 13 W of 4th

(Two townships & Fringe)

Quantity		Detail Sheet No.	Drawing No.	Unit Cost	Total Cost
436	Tangent Structures	1	S-1	16.69	7276.84
34	Additional grounds on tangent structures	1	S-1A	1.97	66.98
29	Single dead end structures	2	S-2A	19.38	562.02
6	Right angle structures	3	S-2B	23.53	141.18
20	Double pin structures	4	S-4	18.71	374.20
20	Taps on existing structure, without disconnects	5	S-5B	5.96	119.20
14	Addition for tap on property side	5		1.00	14.00
65	Farm substation on existing structure with disconnect	7	S-8A	146.00	9490.00
63	Light head guy	8	S-10A	8.55	538.65
20	Heavy head guy	9	S-10B	9.85	197.00
25	Light overhead stub and guy	10	S-10C	21.29	532.25
4	Heavy overhead stub and guy	11	S-10D	24.66	98.64
40	Secondary Spans - 3 wire, 150'	12		22.77	910.80
65	Service with meter (50')	13		27.42	1782.30
65	Shares of Main Substation (65/100 of 1000.00)	18		10.00	650.00
7	Miles of 6A Copperweld Copper Conductor	17		365.13	2555.91
20.32	Miles of #6 B.W.G. Steel Conductor	15		166.76	3388.56
2.06	Miles of #8 B.W.G. " "	16		124.77	257.03
26	Additional for changing tangent to double pin structures	4-1		2,02	52.52
13	Additional for changing tangent to large angle structures	2-1		2.69	34.97
7	Additional light head guys	8	S-10A	8.55	59.85
13	Additional heavy head guys	9	S-10B	9.85	128.05
50	Additional for changing 30' to 35' pole	1		2.75	137.50
10	Additional for changing 30' to 40' poles for R.R. Crossings	19		5.34	53.40
10	Fireguards at R.R. Crossings	19		10.35	103.50
65	Guy Guards	19		1.44	93.60

Total $29,618.95

6900 VOLT FARM LINE — Preliminary Cost Estimate

District: BROOKS AREA — TWP. 20 R - 14 W of 4th M; TWP. 20 R - 13 W of 4th M

Customer Classification

	Number	% of Total	No. Supplied	% of Tot. Supp.
Good	45	28.4	44	
Fair	42	26.6	21	
Poor	71	45.	0	
Total	158	100	65	41.14

Services (Transformer to Customer)

Number	Cost	Cost per Service
65	$12,183.10	$187.43

Line (All line and taps)

Miles	Cost	Cost per Mile
29.38	$16,785.85	$571.34

Total Cost

Total	Cost per Customer	Cost per Unit Area (364 - 1/4 Sections)
$29,618.95	$455.68	81.37

3. Grand Estimated Cost Summary of 8 Areas Surveyed.

SUMMARY OF COST

District	Area Surveyed: Twps. & Fringe	Area Surveyed: Qtr. Secs	Total No. of Farms	No. Supplied	% of Total Supplied	Miles of Line	Average Services Per Mile	Miles of Line per Service	TOTAL COST	Cost per Service	Cost per Qtr. Sec. Surveyed
Clive	1	196	93	65	69.9	42.12	1.54	.65	$35,404.70	$544.69	$180.64
Killam-Strome	1	196	52	32	62	28.3	1.13	.89	20,902.24	653.20	106.64
Camrose	1	196	80	34	42.5	28.06	1.21	.83	20,958.09	616.42	106.92
Rimbey	1	196	74	51	69	31	1.64	.61	26,143.32	512.61	133.38
Olds	2/	399	156	75	48	53.92	1.39	.72	43,215.85	576.21	108.31
Langdon	1	196	68	26	38.3	23.38	1.11	.9	18,203.81	700.15	92.88
Claresholm	2	364	113	67	59.2	52.98	1.26	.79	40,592.68	605.86	111.52
Brooks	2	364	158	65	41.1	29.38	2.21	.45	29,618.95	455.68	81.37
TOTALS	11/	2107	794	415	52.3	289.14	1.44	.7	235,039.64	566.36	111.55

111. Cost Estimates for 10 Areas. (Canadian Utilities Limited)

1. Detailed Cost Estimate for the Construction of:

STANDARD POLE

Dwg. F 1 — 6900 Volt Farm Line

1	30 ft. - class 6 - 3/8 butt treated cedar pole	@ 7.40	$7.40
1	#3034 pole top pin or similar	@ .79	.79
1	#4480 Neutral Bracket	@ .29	.29
1	#505 Insulator	@ .18	.18
2	½ x 8 - 10" machine bolts	@ .10	.20
1	½ x 4" lag screw	@ .05	.05
2	2" square washers	@ .02	.04
2	Pal nuts	@ .02	.04
			8.99
	Staking and clearing R. of way	1.50	
	Labor erecting	3.00	
	Trucking	1.00	
		5.50	5.50
			14.49
	Miscellaneous and incidentals		.73
			15.22

Hardware Cat. Numbers - Slater

Insulator Cat. Numbers - Canadian Porcelain.

DEAD END POLE

Dwg. F 2 — 6900 Volt Farm Line

1	30 ft. - class 6 - 3/8 butt treated cedar pole	@ $7.40	7.40
1	#8080 Suspension Insulator	@ 1.67	1.67
1	5/8 x 8" eye bolt	@ .28	.28
1	2" square washer	@ .02	.02
1	5/8 x 10" eye bolt	@ .31	.31
2	3/8" Thimble	@ .05	.10
6	#22032 Connectors	@ .19	1.14
2	Pal nuts	@ .02	.04
			10.96
	Staking and clearing R. of way	1.50	
	Labor erecting	3.00	
	Trucking	1.00	5.50
			16.46
	Miscellaneous and incidentals 5%		.82
			17.28

Insulator Cat. Numbers - Canadian Porcelain.

DEAD END POLE

Dwg. F 2 — 6900 Volt Farm Line

1	30 ft. - class 6 - 3/8 butt treated cedar pole	@ $7.40	7.40
1	#8080 Suspension Insulator	@ 1.67	1.67
1	5/8 x 8" eye bolt	@ .28	.28
1	2" square washer	@ .02	.02
1	5/8 x 10" eye bolt	@ .31	.31
2	3/8" Thimble	@ .05	.10
6	#22032 Connectors	@ .19	1.14
2	Pal nuts	@ .02	.04
			10.96
	Staking and clearing R. of way	1.50	
	Labor erecting	3.00	
	Trucking	1.00	5.50
			16.46
	Miscellaneous and incidentals 5%		.82
			17.28

Insulator Cat. Numbers - Canadian Porcelain.

90° ANGLE CORNER POLE

	Dwg. F 3	6900 Volt Farm Line	
1	30 ft. - class 6 - butt treated cedar pole	@ $7.40	7.40
2	#8080 Suspension Insulators	@ 1.67	3.34
2	5/8 x 8" Eye Bolts	@ .28	.56
2	2" Square Washers	@ .02	.04
2	5/8 x 10" Eye Bolts	@ .31	.62
4	3/8" Thimbles	@ .05	.20
4	Pal Nuts	@ .02	.08
12	#22032 Connectors	@ .19	2.28
			14.52
	Staking and Clearing R. of Way	1.50	
	Labor erecting	3.50	
	Trucking	1.00	
		6.00	6.00
			20.52
	Miscellaneous and Incidentals 5%		1.02
			21.54

Hardware Cat. Numbers - Slater

Insulator Cat. Numbers - Canadian Porcelain.

TAP POLE

Dwg. F 1A — 6900 Volt Farm Line

Additional Material to be added to Standard Pole Dwg. F 1 for a Tap Off Line.

1	#8080 Suspension insulator	@ $1.67	1.67
1	5/8 x 8" Eye Bolt	@ .28	.28
1	2" square Washer	@ .02	.02
1	5/8 x 10" Eye Bolt	@ .31	.31
2	3/8" Thimble	@ .05	.10
2	Pal Nuts	@ .02	.04
8	#22032 Connectors	@ .19	1.52
1	#3517-4 Hot Line Clamps	@ .97	.97
			4.91
	Labor Erecting	.50	
	Trucking	.50	
		1.00	1.00
			5.91
	Miscellaneous and Incidentals 5%		.29
			6.20

ANGLE POLE UNDER 30°

Dwg. F 1-B — 6900 Volt Farm Line

Additional Material to be Added to Standard Pole Dwg. F 1 for Angle Poles Under 30° Angle or Telephone and Highway Crossings

1	#3034 - Pole Top Pin or similar	@ .79	.79
1	#505 Insulator	@ .18	.18
1	½ x 8" Machine Bolt	@ .09	.09
1	Pal Nut	@ .02	.02
			1.08
	Add Labor Erecting	.25	.25
			1.33
	Miscellaneous and incidentals 5%		.07
			1.40

Guying as per F 5A or F 6A

ANGLE POLE 30° to 60°

Dwg. F 1C — 6900 Volt Farm Line

Addition for angles between 30° and 60°

1	30 ft. class 6 butt treated pole	@ $7.40	7.40
1	#8080 Suspension Insulator	@ 1.67	1.67
2	5/8" x 8" eye bolts	@ .28	.56
2	#82860 Angle Clamps	@ 1.09	2.18
2	2" square washers	@ .02	.04
2	Pal Nuts	@ .02	.04
			11.89
	Staking and clearing Right of Way	1.50	
	Labor erecting	3.00	
	Trucking	1.00	
		5.50	5.50
			17.39
	Miscellaneous and incidentals 5%		.87
			18.26
	Less F 1 Standard Structure		15.22
	Addition Total		$ 3.04

Guying F 5A or F 6A as required

GUY AND ANCHOR

Dwg. F 5A — 6900 Volt Farm Line

For use on short runs and light strains

1	#6004 Guy Strap	@ .21	.21
2	#7448 Two Bolt Clamps	@ .21	.42
1	#8506 ½" x 6' anchor rod	@ .67	.67
1	#37533 Expanding anchor	@ 1.20	1.20
5 lbs	40' - ¼" hard guy wire	@10.83	.55
			3.05
	Staking and clearing right of way	1.50	
	Labor installing	2.00	
	Trucking	.50	
		4.00	4.00
			7.05
	Miscellaneous and incidentals 5%		.35
	LIGHT GUY COMPLETE		7.40

GUY AND ANCHOR

Dwg F 5B — 6900 Volt Farm Line

For Use on Heavy Strains

1	#6004 Guy Strap	@ .21	.21
3	#7448 Two Bolt Clamps	@ .21	.63
1	#8506 ½" x 6' Anchor Rod	@ .67	.67
1	#6069 Expanding Anchor	@ 1.88	1.88
10	lbs. 80'-¼" Hard Guy Wire	"10.83	1.08
			4.47
	Staking and Clearing	1.50	
	Labor	2.00	
	Trucking	.50	4.00
			8.47
	Miscellaneous and Incidentals 5%		.43
	Heavy Guy Complete		8.90

STUB GUY AND ANCHOR

Dwg. F 6 A — 6900 Volt Farm Line

For use on Short Runs and Light Strains

1	25 ft. Class 6 - butt treated Pole	@ 6.50	6.50
1	#6004 Guy Strap or similar	@ .21	.21
4	#7448 Two Bolt Guy Clamps or similar	@ .21	.84
1	#7502 Eye Nut or similar	@ .40	.40
1	3/8" Guy Thimble or similar	@ .05	.05
1	#9060 5/8" x 8" Thimble Eye Bolt or similar	@ .33	.33
1	#8506 $\frac{1}{2}$" x 6' Anchor Rod or similar	@ .67	.67
1	#37533 Expaning Anchor or similar	@ 1.20	1.20
13	lbs. 100' - $\frac{1}{4}$" Hard Guy Wire	10.83 C	1.41
2	Pal Nuts	@ .02	.04
			11.65
	Staking and clearing R. of Way	3.00	
	Labor Installing	4.50	
	Trucking	1.50	
		9.00	9.00
			20.65
	Miscellaneous and incidentals 5%		1.03
			21.68

STUB GUY AND ANCHOR

	Dwg. F 6B	6900 Volt Farm Line	
	For use on Heavy Strains		
1	25 ft. class 6 butt treated pole	@ 6.50	6.50
1	#6004 Guy Strap	@ .21	.21
6	#7448 Two Bolt Clamps	@ .21	1.26
1	#7502 Eye Nut	@ .40	.40
1	3/8" Guy Thimble	@ .05	.05
1	#9958 5/8 x 8 Thimble Eye Bolt	@ .33	.33
1	#8506 $\frac{1}{2}$" x 6' Anchor Rod	@ .67	.67
1	#6069 Expanding Anchor	@ 1.88	1.88
26	lbs. 200'-$\frac{1}{4}$" Hard Guy Wire	10.83	2.82
2	Pal Nuts	@ .02	.04
			14.16
	Staking and Clearing R. of Way	3.00	
	Labour Installing	4.50	
	Trucking	1.50	9.00
			23.16
	Miscellaneous and Incidentals		1.15
			24.31

CONDUCTOR #6 B.W.G. STEEL

F 8 — 6900 Volt Farm Line

#6 B.W.G. Grade 85 Steel Wire
Min. Breaking Strength 2590 lbs.- Hot Galvanized
Resistance 10 ohms per mile @ 20° C.
Weight 580 lbs. per mile - Copper equivalent - 13 -B & S

2 miles	#6 B.W.G. wire 1160 lbs	@ 7.90	91.64
12 lbs.	#8 soft tie wire	@ 9.00	1.08
8	Nicopress Sleeves	@ .25	2.00
			94.72
	Labour Stringing and Tieing per mile of Line	20.00	
	Trucking Expense	5.00	
		25.00	25.00
			129.72
	Miscellaneous and incidentals 5%		6.48
			136.20

(300' Span $7.75)

CONDUCTOR #8 - B.W.G. STEEL

F 9 — 6900 Volt Farm Line

#8 B.W.G. Grade 85 Steel Wire
Min. breaking strength 1710 lbs. - hot galvanized
Resistance 15.14 ohms per mile @ 20° C.
Weight 383 lbs. per mile - Copper equivalent - 15 - B & S

2 miles	#8 B.W.G. wire 766 lbs.	@ 7.90	$60.51
12 lbs.	#8 Soft tie wire	@ 9.00	1.09
8	Nicopress sleeves	@ .25	2.00
			$63.60
	Labor Stringing and Tieing per Mile of Line	20.00	
	Trucking Expenses	5.00	25.00
			$88.60
	Miscellaneous and Incidentals 5%		4.40
			$ 93.00

CONDUCTORS #4 A.C.S.R.

F 10 — 6900 Volt Farm Line

#4 A.C.S.R. - 7 strand, consisting of
6 aluminum and 1 steel wire
Ultimate strength - 1825 lbs.
Resistance 2.22 ohms per mile @ 25° C.
Weight 302 lbs.per mile - Copper equivalent - #6 B & S

2 miles	#4 A.C.S.R. - 604 lbs.	@ 28.00	169.10
3½ lbs	Flat armor wire	@ 40.00	1.40
5 lbs.	#6 tie wire	@ 40.00	2.00
4	#544 joints	@ .30	1.20
36 sets	Armor rods and ferrules	@ .40	14.40
			$188.10
	Labor stringing and tieing per mile of line	25.00	
	Trucking	5.00	
		30.00	30.00
			218.10
	Miscellaneous and incidentals 5%		19.90
			$238.00

(300' Span $13.50)

S E R V I C E

F 11 — 6900 Volt Farm Line

50 Ft. - 3 wire Service

3	#1607 Service Insulators	@ .18	1.08
10 lbs.	(150') #8 D.B. W.P. Wire	@ .27	2.70
1	10 amp 3 wire meter inc. testing	@ 16.19	16.19
1	Type A meter Box	@ 2.25	2.25
			22.22
	Labor installing	1.50	
	Trucking	.50	2.00
			24.22
	Miscellaneous and incidentals 5%		1.21
			25.43

RUN OFFS

F 12 — 6900 Volt Farm Line

First Primary Span - 300 Ft.

1	F1A Tap pole addition	6.20	
1	F2 End structure	17.28	
1	Span F 9 conductor	5.30	
		28.78	$28.78

Includes labor, etc.
Add guys as required

F 13

Additional Primary Spans - 300'

1	F1 structure	15.22	
1	Span F9 conductor	5.30	
		20.52	$20.52

Includes labor etc.

RUN OFFS

F 14 — 6900 Volt Farm Line

Secondary Span - 150'

1	25' Class 6 Butt treated Pole	@ 7.00	7.00
3	#1607 Service Insulators	@ .18	.54
30 lbs	(450') #8 D.B. W.P. Wire	@ .27	8.10
			15.64
	Staking and Clearing	1.00	
	Labor	3.00	
	Trucking	.50	
		4.50	4.50
			20.14
	Miscellaneous and Incidentals 5%		1.00
			21.14

Add guys as required.

STANDARD TRANSFORMER INSTALATION

Dwg. F. 16 — 6900 Volt Farm Line

1	1½ KVA 6900 /115/230 volt rural type transformer - no taps		$81.55
1	#6484 Tripolink fuse switch		8.45
1	Fuse Link		.40
1	6900 Volt arrester		14.97
5 lbs.	(Approx. 35 ft) #4 bare stranded ground wire	@ .20	1.00
1	Ground wire guard and staples		.50
2	#9338-C 3/4 x 8' ground rods & connectors	@ 1.24	2.48
2	#1607 Service Insulators	@ .17½	.35
6	Connectors	@ .19	1.14
1	⅝ x 8" Machine Bolt	@ .09	.09
2	⅝ x 10" Machine Bolts	@ .11	.22
2	2" x 2" Washers	@ .02	.04
2	Pal Nuts	@ .02	.04
			111.23
	Labor	10.00	
	Trucking	2.00	12.00
			123.23
	Miscellaneous and Indicentals		6.16
			129.39

SUBSTATION

Dwg. F 20 — 6900 Volt Farm Line

Single phase 13800/6900 stepdown station. Estimated to serve 100 Farm Customers.

1	50 KVA 13800/6900 single phase transformer inc. 3-4½% Reduced capacity taps - Pref. cart. C/L Lots		$632.92
2	13800 volt lightning arresters	@ 32.00	64.00
2	6900 " " "	@ 14.97	29.94
2	13800 " fuse switches (#5702-10)	@ 18.15	36.30
2	6900 " fuse switches	@ 11.40	22.80
15 lbs	#4 Stranded bare wire (grounds)	@ .20	3.00
4	3/4 x 8' ground rods and connectors	@ 1.24	4.96
3	Ground wire guards and staples	@ .50	1.50
	Cross arms, pins, insulators, etc		9.75
			805.17
	Labor erecting	25.00	
	Trucking	5.00	
		30.00	30.00
			835.17
	Miscellaneous and incidentals 5%		41.75
	SUBSTATION COMPLETE		$876.92

RAILROAD CROSSING

	Dwg. F 23	6900 Volt Farm Line	
2	40' class 6 butt treated cedar poles	@ 12.40	24.80
4	#3034 pole top pins	@ .79	3.16
4	#505 Insulators	@ .18	.72
4	½" x 8" machine bolts	@ .09	.36
2	5/8 x 10" eye bolts	@ .31	.62
2	7502 eye nuts	@ .40	.80
6	22032 connectors	@ .19	1.14
6	Pal Nuts	@ .02	.12
20 lbs	160' -¼" hard guy wire	@10.61	2.15
			33.87
	Staking and clearing	3.00	
	Labor erecting	6.50	
	Trucking	1.50	
		11.00	11.00
			44.87
	Miscellaneous and incidentals		2.24
			47.11
2	F 5A guy and anchor	@ 7.40	14.80
			61.91
	Less one F 1 Standard Structure		15.22
			46.69

EXTRAS

F 25 — 6900 Volt Farm Line

Additional to be added per Substation

160	35' poles replacing 30'	@ 2.50	400.00
100	Guy guards Wood guard 1.00 Installing .25 Trucking .25 1.50	@ 1.50	150.00
160	Extra ground installations (1 every ½ mile or 2600') 35' #6 steel conductor .30 Guard & staples .40 Labor & trucking 1.00 1.70	@ 1.70	272.00
40	F 1B Double pin additions for telephone and highway crossings and small angles	@ 1.40	56.00
20	F 1C 30° to 60° angle	@ 3.04	60.80
20	F 5B Heavy guys	@ 8.90	178.00
			$1,116.80

2. Typical Cost Estimates for Surveyed Areas.

EXPLANATIONS OF FARM LINE SPECIFICATIONS

The type of rural transmission line we are advocating is a single phase 6900 volt to ground with, one phase wire carried at the top of pole and a solidly grounded neutral wire carried on a bracket on the side of the pole. This neutral wire acts as a common neutral both for primary and secondary.

The present transmission lines would act in most districts at least, as feeders for the rural lines. In this way, the rural lines would be kept separate, and trouble on the rural lines would not affect main transmission lines. The majority of our existing transmission lines are 13800 volt three phase 60 cycle Delta and 23000 volt Eye.

While all estimates have been based on separate pole line for rural service, at those points where there are existing lines, a separate rural circuit could be carried on existing poles.

All rural lines have been designed for single phase service only, which is ample for the loads in prospect. Individual motors up to 3 H.P. single phase can be handled, which size motor is large enough for the majority of farm purposes. Those farms needing larger sources of power have tractors for this purpose.

By the use of a solid grounded neutral system, the number of fuse switches, lightning arresters, sectionalizing switches and insulators is cut in half, over what would be required on a two wire single phase system. Furthermore, no cross arms are required, which all means a very substantial reduction in costs.

Our reasons for choosing 6900 volt are as follows:

Comparative low cost of insulators, switches and transformers.

Voltage is high enough that a lower cost conductor can be used without excessive drop. In a rural electrification scheme, it will be necessary to parallel telephone lines at many points. At this voltage there should be no trouble due to inductive interference if the telephone lines are in reasonably good shape. Upon consultation with other Power Companies, serving rural districts, they all favor this voltage, even in cases where for other reasons they are using a different voltage.

2. Vertical Construction

This type of construction makes a great saving in materials and labor. It, of course, can be used on a solid grounded neutral system only. This type of construction has proven very satisfactory where low first cost was a primary essential.

3. Span Length

With an average span length of approximately 325 feet, adequate ground clearance can be given by using 30 ft. poles. To increase span lengths beyond this point would necessitate longer poles to compensate for increased sag. Furthermore, it would make it more difficult to locate poles at the proper points for taking off service to customers. To shorten spans would increase costs without any compensating factors. Allowances have been made in our estimates for use of longer poles where necessary for telephone and railroad crossings, etc.

4. Class of Poles

We have specified A.S.A. Class 6 poles, creosote butt treatment, Pentrex method. Class 6 poles have a minimum cirdumference of 17" at top and minumum circumference of 28.5" at the ground line. This size pole is considered ample for these light lines. The use of native poles (Jack Pine) have not been considered due to their short life. Our operating experience has been that cedar poles, butt treated are far the cheapest over a term of years.

5. Conductor

There are several types of conductor suitable for this purpose, such as

A.C.S.R.	-	Aluminum Cable Steel Reinforced
C.C.S.R.	-	Copper Cable Steel Reinforced
Copperweld Copper	-	Three Strand
Copperweld	-	Solid and three strand.
Steel	-	Solid and three strand.

For the purpose of our estimates, we have specified #6 B.W.G. solid steel wire as our main conductor along road allowance. In many cases where the distance covered from the substation is short, and there is little probability of further extensions, this conductor will have sufficient carrying capacity to give fair regulation. We have, however, made an allowance in our estimates for the use of a higher current carrying capacity conductor for a portion of the line where there is a likelihood of further extensions or further increase in load. For the run off to individual customers we have specified #8 B.W.G. steel. The final decision as to the type and size of conductor will have to be left until final plans of the territories to be servied have been decided upon. The use of steel as conductor reduces conductor costs by approximately 50% and to keep costs down, steel should be used as conductor whereever possible. If farm loads should grow much heavier than anticipated, there by affecting regulation adversly, small, comparatively low cost step type regulators could be installed at the substation.

6. Hardware

Half inch galvanized hardware has been specified as standard and 5/8 hardware used at points of severe strain only. The desirability of using black hardware in an effort to still further reduce costs is under consideration.

7. Anchors

We have specified the use of patent expanding anchors, for several reasons. In a line of this type, there will be many short runs with light strains. A smaller anchor can be used for these, and the heavier type for the heavier strains. The use of patent anchors will materially reduce the cost of labor for installation over the standard method of deadman anchors.

Also, under the method we propose of bonding the guy wires direct to the system neutral, these patent anchors will provide additional grounds.

8. Guying

We have specified $\frac{1}{4}$" crucible steel seven strand guy wire with a breaking strain of 6000 lbs. On light guys a single run will be used, and on the heavier strains, the guy wire will be doubled. By doing this, only one size

of guy wire need be carried. As they guy wire will be bonded to the system neutral at one end and grounded through the use of patent anchors at the other end, there will be no need of installing strain insulators in the guys and thereby make a saving both by reducing the number of guy clamps needed and eliminating the strain insulators.

9. Service Wires to Customer

Estimates have been based on carrying service wires to the customer's house the same as is the standard practice in town distribution. Consideration is being given to installing the meter and a thermal type main switch on the transformer pole, but for the purpose of this estimate, this portion of the installation would form part of the wiring cost of the farm. The advantages of having the meter and main switch located on the transformer pole would be, convenience of meter reading and the case of distributing to the various farm buildings from this point. By the use of thermal switches, transformers could be fused for short circuit protection only, thereby eliminating calls for the replacing of transformer fuses. A small test light could be incorporated in the meter box so that the customer could do his own testing, thus eliminating calls to the central station for local trouble. By the use of a thermal type main switch, farm secondary fuses could not be plugged, thereby causing interference with service to other customers.

10. Transformer and Meter

The transformer we have provided for is a rural type with one primary bushing only, The bushing is located in the cover, the other end of the primary winding being solidly grounded and interconnected with the system neutral. The standard size would be a $1\frac{1}{2}$ K.V.A. - 6900/115/230 volt, to provide three wire 115/230 volt service to each farm. The question of providing one 5% reduced capacity tap is under consideration.

A standard 10 amp three wire meter with A Box is used.

From what data we have gathered to date, we believe that $1\frac{1}{2}$ K.V.A. transformers will be large enough to carry at least 90% of the customers. In some cases where customers instal electric ranges or other heavy duty appliances, it will be necessary to instal a 3 KVA and in odd locations, a 5 KVA. If loads should be built up greater than anticipated, the small transformer could be replaced at low cost with a larger transformer and the small transformer moved to a new district not yet built up.

11. Substations

A study of a map of Alberta showing the transmission lines of the two Power Companies will indicate that the mahority of the lines run north and south and cover all the better settled areas of the Province, and that by extending rural lines a distance of 12 miles each side of the existing feeder lines, a very good coverage of the better farming districts in this Province is possible. By locating small 50 KVA unit substations along existing lines and radiating rural lines from these, substation costs are kept to a minimum. If loads should increase, all that would be necessary would be to increase the number of these unit substations. Based on the assumption of a diversified peak demand of 500 watts per farm customer, one substation would serve 100 customers. By the use of 50 KVA units, the load on main transmission line could be evenly balanced. These unit substations could be shifted with little expense, if necessary due to changes in load. By having one standard size unit, the number of spare transformers for replacement due to lightning damage or other causes would be kept to a minimum.

12. Grounding

It is proposed to instal two driven grounds (3/4 x 8" rods) at each rural transformer installation in addition to the grounds on the customers' premises. Further grounds will be provided through the method of guying proposed and in addition, the line will be further grounded by the use of pancake coils attached to bottom of poles, so that on no portion of the line will grounds be nore than $\frac{1}{2}$ mile apart. Grounding conditions will be good, for dry, gravelly or sandy districts cannot support rural lines. We believe that the system ground resistance in the territory to be served can be kept down to 5 ohms. We will be making tests on a number of sample grounds under various weather conditions.

13. All estimates have been based on purchasing materials in carload quantities at present day prices F.O.B. Calgary. Labor costs have also been based at present day prices, the use of modern mechanical methods where possible, and the work being done progressively under reasonable weather and road conditions.

Five percent has been added to all estimated costs to provide for reshipment, handling and slight fluctuations in prices.

A figure of 10% has been used to cover engineering and office expenses.

14. Demand per Customer

A figure of 500 watts diversified demand has been used per customer. From what data we have gathered to date, this figure seems ample. We have installed demand meters at a number of our existing farm customers, and have records of the number and type of appliances in use by these customers.

We are continuing to make tests and gather further data and information on farm loads.

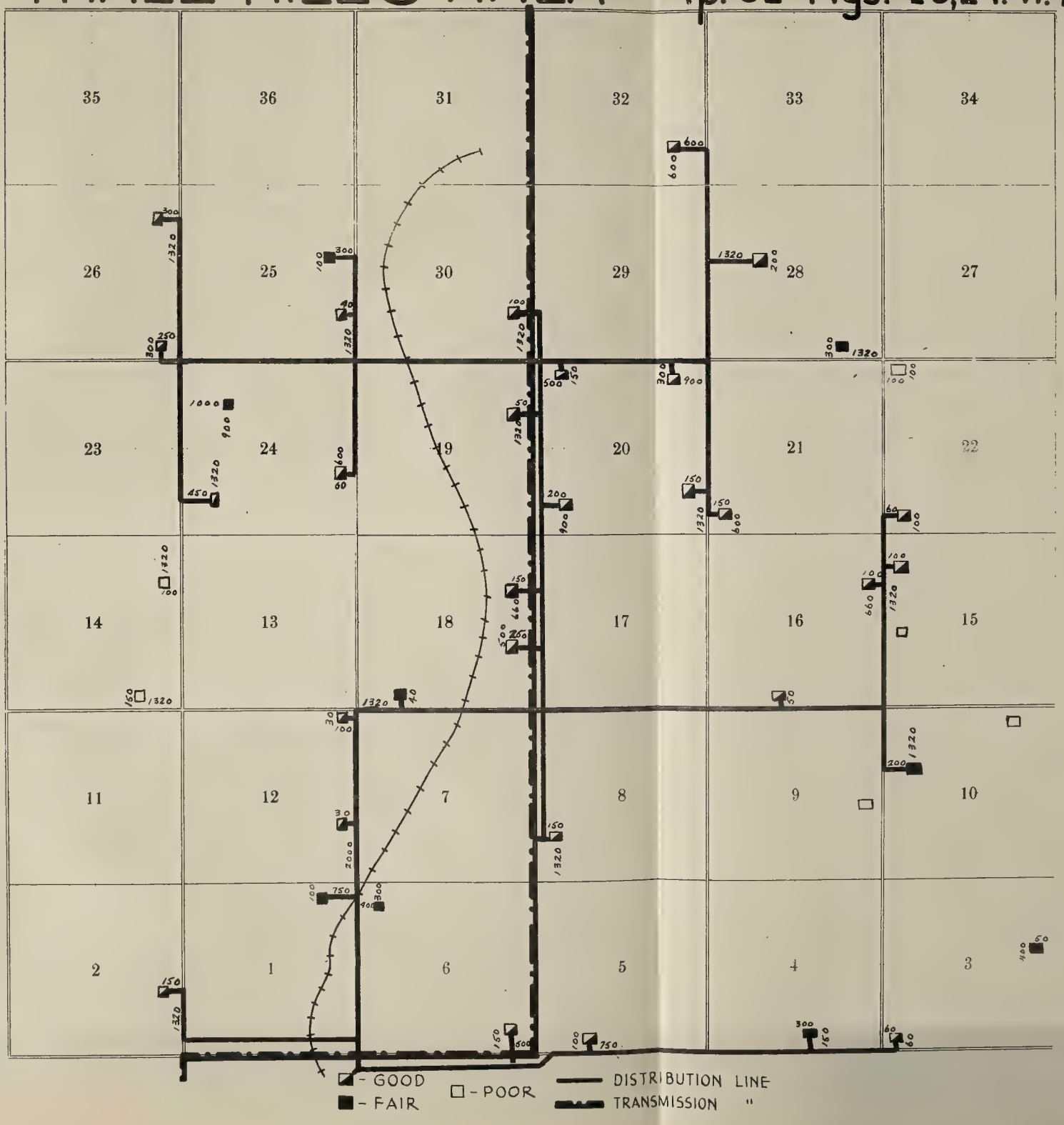
15. Right of Way

All estimates have been based on using road allowances for location of rural lines where feasable. At points where it is necessary to enter upon private property, easements must be provided by the farmers without charge.

16. Organization

No provision has been made in these estimates to cover organization or preliminary survey expenses. What work has been done to date by our Company has been done on staff account.

THREE HILLS AREA Tp. 32 Rgs. 23,24. W.4 M.



THREE HILLS AREA

FARM LINE

357	F1 Structures	@ 15.22	$5,433,54	
15	F2 Structures	@ 17.28	259.20	
2	F3 Structures	@ 21.54	43.08	
11	F1A Additions	@ 6.20	68.20	
19	F5B Guys	@ 8.90	169.10	
3	F6B Stub and Guys	@ 24.31	72.93	
5	Miles F10 Conductor	@238.00	952.00	
17.1	Miles F8 Conductor	@136.20	2,329.02	
			9,327.07	$9,327.07

SERVICE AND RUN OFFS

32	F11 Services	@ 25.43	813.76	
13	F12 Primary Span	@ 28.78	374.14	
7	F13 Extra Span	@ 20.52	143.64	
19	F14 Sec. Spans	@ 21.14	401.66	
22	F5A Guys	@ 7.40	162.80	
4	F6A Stub and Guys	@ 21.68	86.72	
			1,982.72	1,982.72
32	Transformer installations	@129.39		4,140.48
32/100	Substation	@876.92		280.61
4	Railroad Crossings	@ 46.69		186.76
32/100	Extras	@ 1116.80		357.37
				16,275.01
	Engineering and Superintendence 10%			1,627.50
	Total Capital Cost			$17,902.51

THREE HILLS AREA

#1

Area 1 Township 36 Square Miles

42 Farms -- 27 Good 9 Fair 6 Poor

Probable Connections 32 76%

Number of Farms within ½ mile of lines 37 or 88%

Proposed line on Road 21.1 miles

Run offs to farms 1.7 miles

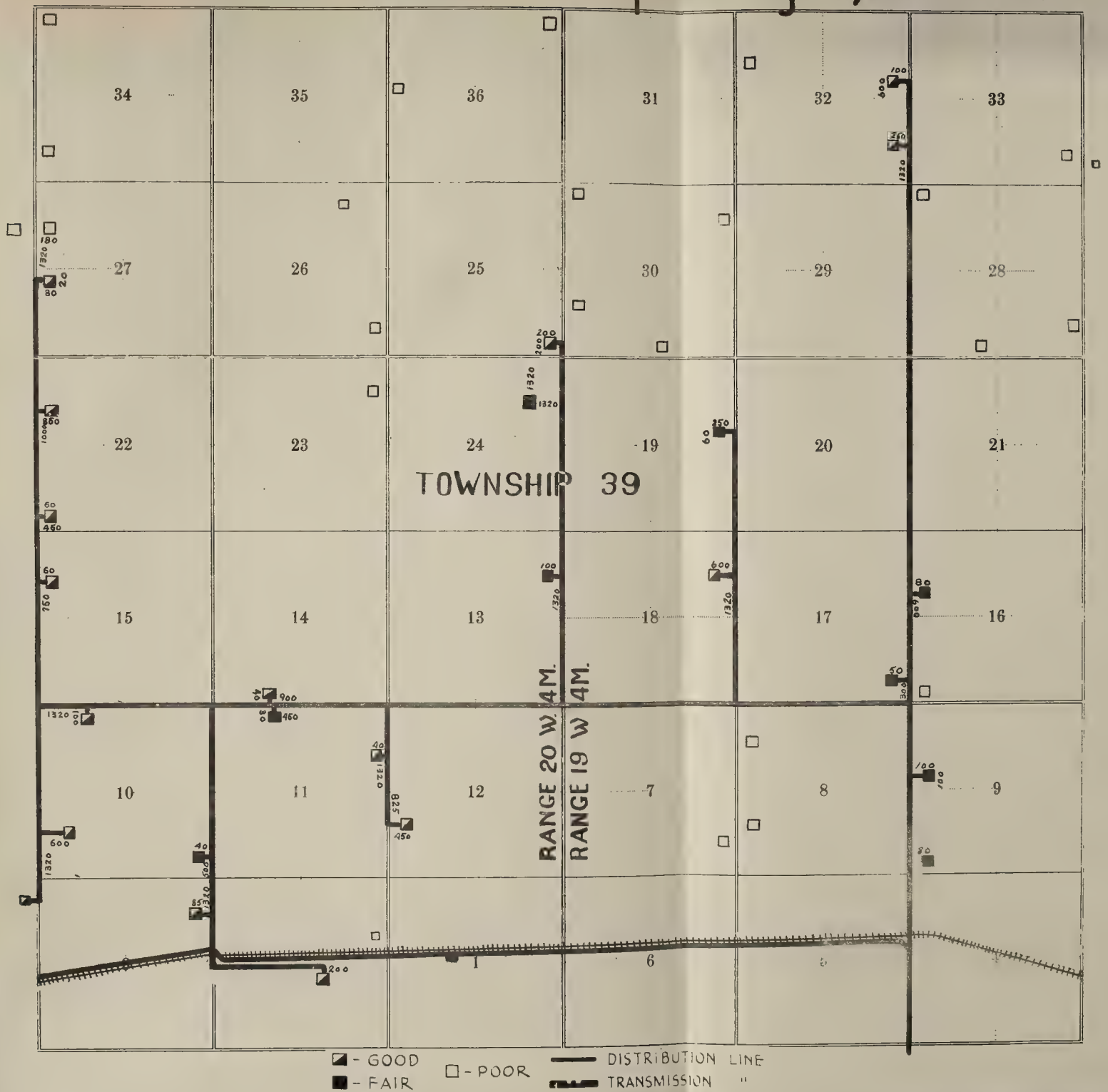
Total 22.8 miles

Railroad Crossings 4

Cost per connection -- $559.45

Miles of line and run off per connection .71

STETTLER AREA Tp. 39 Rgs. 19/20 W.4 M.



STETTLER AREA

FARM LINE

336	F1 Structures	@ 15.22	$5,113.92	
8	F2 Structures	@ 17.28	138.24	
1	F3 Structures	@ 21.54	21.54	
6	F1A Additions	@ 6.20	37.20	
12	F5B Guys	@ 8.90	106.80	
4	F6B Guys	@ 24.31	97.24	
4	Miles Conductor, F10	@ 238.00	952.00	
15.8	Miles F8 Conductor	@ 136.20	2,151.96	
			8,618.90	$8,618.90

SERVICE AND RUN OFFS

21	F11 Services	@ 25.43	534.03	
7	F12 Primary Span	@ 28.78	201.46	
2	F13 Extra Span	@ 20.52	41.04	
12	F14 Secondary Span	@ 21.14	253.68	
11	F5A Guys	@ 7.40	81.40	
3	F6A Guys	@ 21.68	65.04	
			1,176.65	1,176.65

21	Transformer installations	@ 129.39	2,528.19
21/100	Substation	@ 876.92	184.15
2	Railroad Crossings	@ 46.69	93.38
21/100	Extras	@ 1116.80	234.52
			12,835,79
	Engineering and Superintendence 10%		1,283.57
			$14,119.36

STETTLER AREA

5

AREA 1 TOWNSHIP 36 SQUARE MILES

49 Farms -- 16 GOOD 11 FAIR 22 POOR

Probable Connections 21 or 42%

Number of Farms within ½ mile of lines 31 - 63%

Proposed line on road	19.8	miles
Run Offs to farms	.9	miles
Total	20.7	miles

2 Railroad Crossings

Cost per connection $672.35

Miles of line and run off per connection .98

CASTOR AREA Tp. 38 Rg. 13 W. 4 M.

CASTOR AREA

FARM LINE

374	F1 Structure	@ 15.22	$5,692.28	
10	F2 Structure	@ 17.28	172.80	
5	F3 Structure	@ 21.54	107.70	
9	F1A Additions	@ 6.20	55.80	
17	F5B Guys	@ 8.90	151.30	
10	F6B Stub & Guys	@ 24.31	243.10	
4	Miles F10 Conductor	@ 238.00	952.00	
18.3	Miles F8 Conductor	@ 136.20	2,492.46	
			9,867.44	$9,867.44

SERVICE AND RUN OFFS

21	F11 Services	@ 25.43	534.03	
12	F12 First Spans	@ 28.78	345.36	
12	F13 Extra Spans	@ 20.52	246.24	
5	F14 Secondary Spans	@ 21.14	105.70	
24	F5A Guys	@ 7.40	177.60	
4	F6A Stub and Guys	@ 21.68	86.72	
			1,495.65	1,495.65
21	F16 Transformer Installations	@ 129.39		2,717.19
21/100	F20 Substation	@ 876.92		184.15
21/100	F25 Extras	@1116.80		234.52
				14,498.95
	Engineering and Superintendence 10%			1,449.89
				$15,948.84

CASTOR AREA

#10

Area - 1 Township

44 Farms -- 15 Good 12 Fair 17 Poor

Probable Connections - 21 -- 47%

Number of farms within ½ mile of lines -- 30 -- 68%

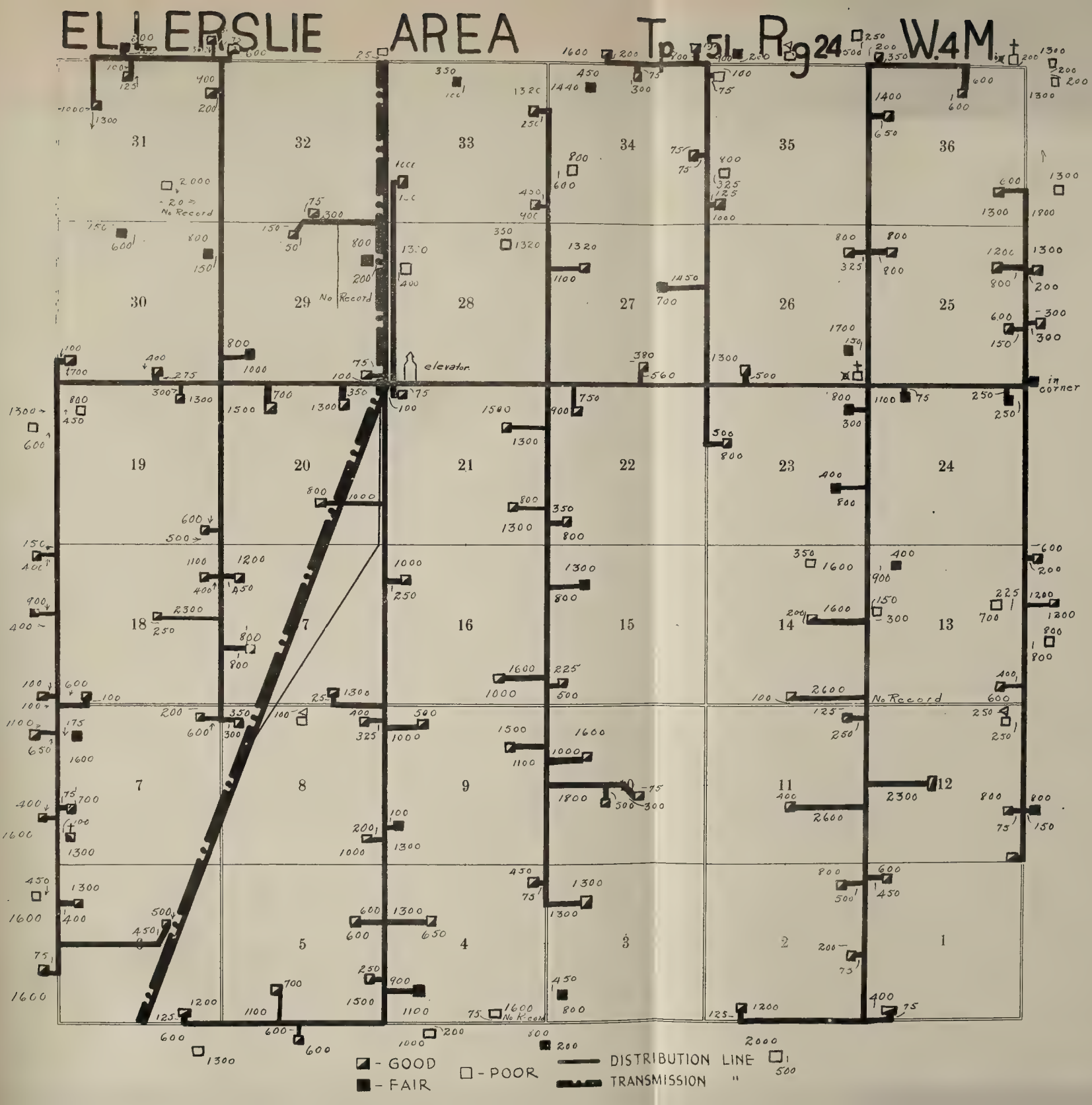
Proposed line on roads -- 22.3 miles

Run offs to farms 1.1 Miles

Total 23.4 Miles

Cost per connection $759.46

Miles of line and run offs per connection 1.1


ELLERSLIE AREA Tp 51 Rg 24 W4M
31
32
33
34
35
36
30
29
No Record
28
27
26
25
elevator
19
20
21
22
23
24
18
17
16
15
14
13
7
8
9
10
11
12
5
4
3
2
1
No Record
- GOOD
- FAIR
- POOR
DISTRIBUTION LINE
TRANSMISSION

ELLERSLIE AREA

FARM LINE

715	F1 Structures	@ 15.22	$10,882.30	
31	F2 Structures	@ 17.28	362.88	
4	F2 Structures	@ 21.54	86.16	
15	F1A Additions	@ 6.20	93.00	
26	F5B Guys	@ 8.90	231.40	
4	F6B Stub and Guys	@ 24.31	97.24	
6	mi F10 Conductor	@ 238.00	1,428.00	
36.25	mi F8 Conductor	@ 136.20	4,937.25	
			$18,118.23	$18,118.23

SERVICES AND RUN OFFS

103	F11 Services	@ 25.43	2,619.29	
74	F12 First Spans	@ 28.78	2,129.72	
127	F13 Extra Spans	@ 20.52	2,606.04	
36	F14 Secondary Spans	@ 21.14	761.04	
141	F5A Guys	@ 7.40	1,043.40	
35	F6A Stub and Guys	@ 21.68	758.80	
			$9,918.29	$ 9,918.29

103	F16 Transformer Installations	129.39	13,327.17
1	Fa0 Substation	@ 876.92	876.92
1	F25 Extras	@1116.80	1,116.80
2	F23 Railway Crossings	@ 46.69	93.38
			$43,450.79
	Engineering and Superintendence 10%		4,345.07
	Total Capital Cost		$47,795.86

ELLERSLIE AREA

6

AREA - 1 Township

130 Farms -- 91 Good 25 Fair 14 Poor

N.B. Fringe farms given assumed classification.

Probable Connections - 103 79%

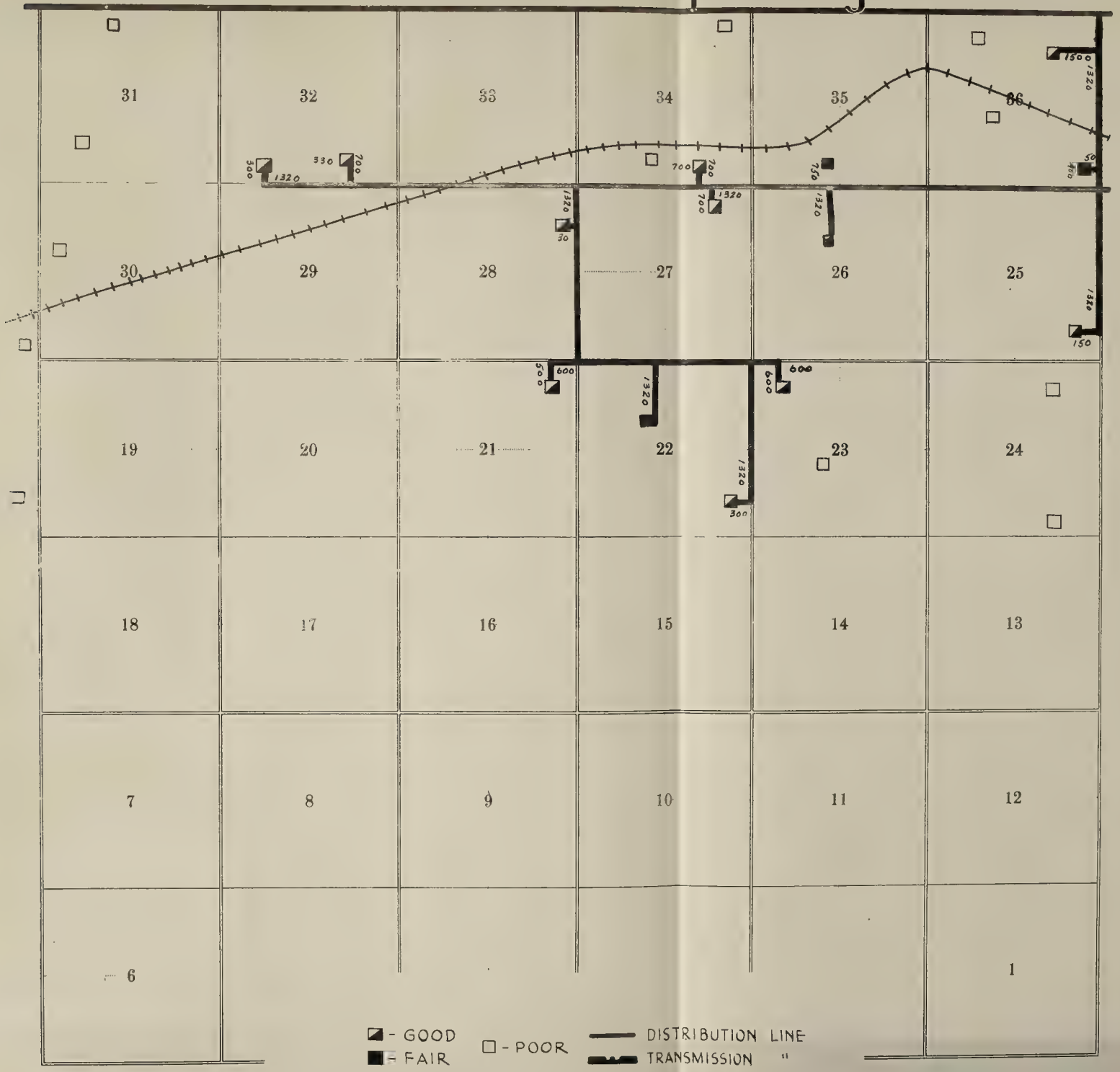
Number of farms within ½ mile of lines 127 - 97%

Proposed lines on Road Allowance	-	42.25 miles
Run Offs to farms		12.40 miles
Total	--	54.65 miles

Cost per connection $464.03

Miles of line and run off per connection .53

VERMILION AREA Tp. 50 Rg. 7 W. 4 M.



VERMILION AREA

FARM LINE

161	F1 Structures	@ 15.22	$ 2,450.42	
6	F2 Structures	@ 17.28	103.68	
4	F1A Addition	@ 6.20	24.80	
8	F5B Guys	@ 8.90	71.20	
1	F6B Guy and Stub	@ 24.31	24.31	
2	mi. F10 Conductor	@ 238.00	476.00	
7.4	mi. F8 Conductor	@ 136.20	1,007.88	
			$4,158.29	$4,158.29

SERVICES AND RUN OFFS

13	F11 Services	@ 25.43	330.59	
11	F12 Primary Span	@ 28.78	316.58	
17	F13 Extra Spans	@ 20.52	348.84	
4	F14 Secondary Spans	@ 21.14	84.56	
19	F5A Guy	@ 7.40	140.60	
3	F6A Stub and Guy	@ 21.68	65.04	
			$1,286.21	$1,286.21

13	Transformer Installations	@ 129.39	1,682.07
13/100	Substation	@ 876.92	113,99
2	Railroad Crossings	@ 46.69	93.38
13/100	Extras	1116.80	145.18
			$7,479.12
	Engineering and Superintendence 10%		747.91
	Total Capital Cost		$8,227.03

VERMILION AREA

4

AREA ½ Township 18 Square Miles

27 Farms -- 12 Good 3 Fair 12 Poor

Probable Connections 13

Number of farms within ½ mile of lines 18

Proposed line on road	9.4 miles
Run off to farms	1.7 miles
Total	11.1 miles

2 Railroad Crossings

Cost per connection $632.84

Miles of line and run off per connection .85

CLANDONALD AREA
Tp 52 Rg 6 W.4 M.
priest's house
church
community hall
school
school
church
LAKE
31
32
33
34
35
36
30
29
28
27
26
25
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6
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4
3
2
1
- GOOD
- FAIR
- POOR
DISTRIBUTION LINE
TRANSMISSION "

CLANDONALD AREA

FARM LINE

533	F1 Structures	@ 15.22	$8,112.26	
12	F2 Structures	@ 17.28	207.36	
4	F3 Structures	@ 21.54	86.16	
12	F1A Additions	@ 6.20	74.40	
23	F5B Guys	@ 8.90	204.70	
3	F6B Stub and Guys	@ 24.31	72.93	
4	Miles F10 Conductor	@ 238.00	952.00	
27.6	Miles F8 Conductor	@ 136.20	3,759.12	
			13,468.93	$13,468.93

SERVICES AND RUN OFFS

41	F11 Services	@ 25.43	1,042.63	
25	F12 First Spans	@ 28.78	719.50	
40	F13 Extra Spans	@ 20.52	820.80	
16	F14 Secondary Spans	@ 21.14	338.24	
52	F5A Guys	@ 7.40	384.80	
16	F6A Stub and Guys	@ 21.67	346.72	
			3,652.69	3,652.69
41	F16 Transformer Installations	@ 129.39		5,304.99
41/100	F20 Substation	@ 876.92		359.53
41/100	F25 Extras	@116.80		457.88
				23,244.02
	Engineering and Superintendence 10%			2,324.40
				$25,568.42

CLANDONALD AREA

#8

AREA 1 Township

62 Farms -- 29 Good 25 Fair 8 Poor

Probable Connections 41 66%

No. of farms within ½ mile of lines 51 82%

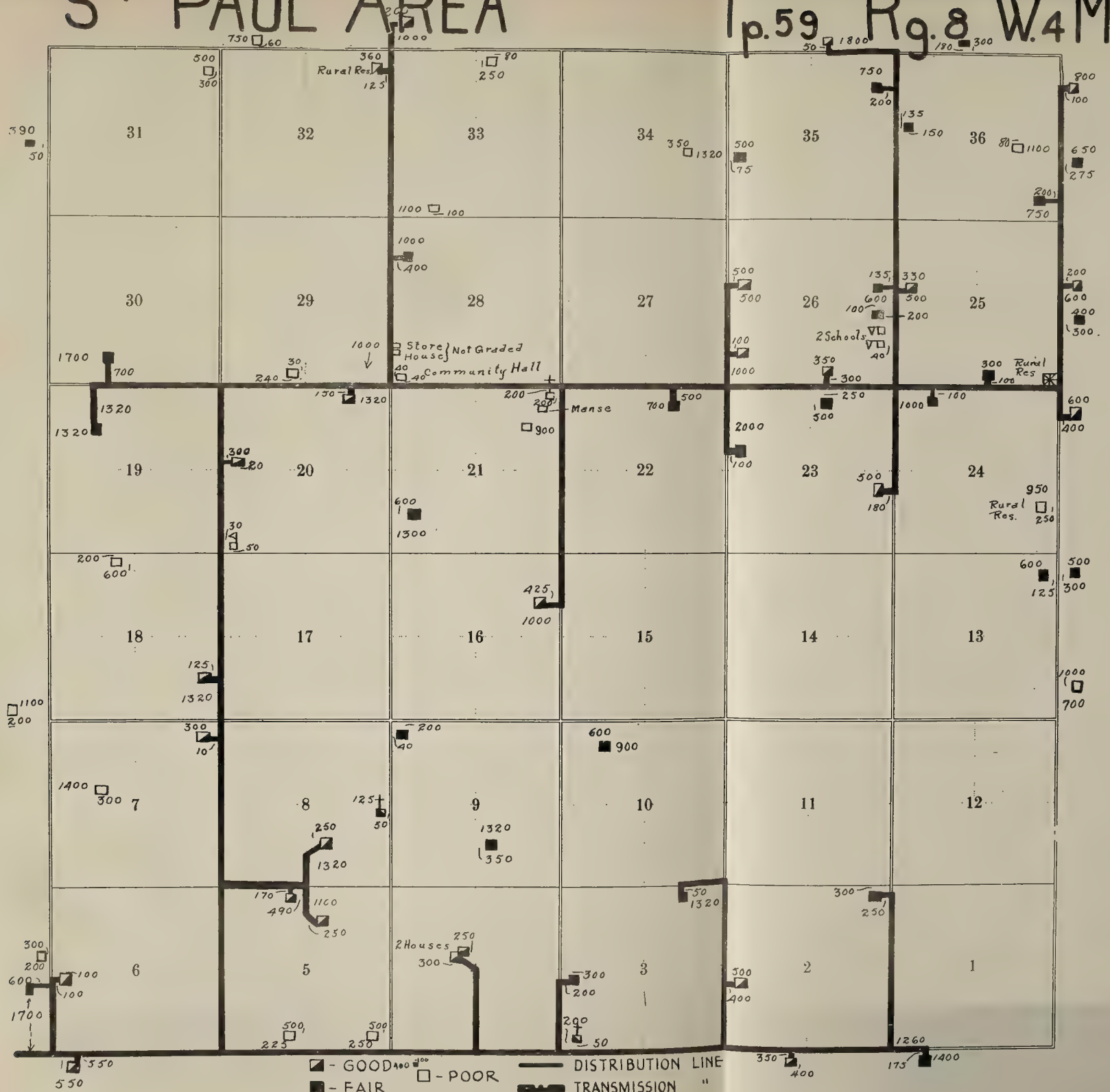
Proposed line on Road Allowance	31.6 Miles
Run offs to farms	4.3 Miles
Total	35.9 Miles

Cost per connection $623.62

Miles of line and run offs per connection .87

St. PAUL AREA

Tp. 59 Rg. 8 W. 4 M



ST. PAUL AREA

FARM LINE

472	F1 Structures	@ 15.22	$7,183.84	
17	F2 Structures	@ 17.28	293.76	
1	F3 Structures	@ 21.54	21.54	
16	F1A Additions	@ 6.20	99.20	
18	F5B Guys	@ 8.90	160.20	
7	F6B Stub and Guys	@ 24.31	170.17	
4	Miles F10 Conductor	@ 238.00	952.00	
23.8	Miles F8 Conductor	@ 136.20	3,241.56	
			12,122.27	$12,122.27

SERVICES AND RUN OFFS

40	F11 Services	@ 25.43	1,017.20	
27	F12 First Spans	@ 28.78	777.06	
30	F13 Extra Spans	@ 20.52	615.60	
15	F14 Secondary Spans	@ 21.14	317.10	
51	F5A Guys	@ 7.40	377.40	
12	F6A Stub and Guys	@ 21.67	260.04	
			3,364.40	3,364.40
40	F16 Transformer Installations	@ 129.39		5,175.60
40/100	F20 Substation	@ 876.92		350.76
40/100	F25 Extras	@1116.80		446.72
				21,459.75
	Engineering and Superintendence 10%			2,145.97
				$23,605.72

ST. PAUL AREA

9

AREA 1 Township

70 Farms -- 25 Good 30 Fair 15 Poor

Probable Connections 40 57%

No. of farms within ½ mile of lines 53 75%

Proposed line on Road Allowance	27.8 miles
Run offs to farms	3.5 miles
Total	31.3 miles

Cost per connection $590.14

Miles of line and run offs per connection .78

VEGREVILLE AREA Tps. 52, 53. Rg. 15 W. 4 M.

VEGREVILLE AREA

FARM LINE

281	F1 Structures	@ 15.22	$ 4,276.82	
9	F2 Structures	@ 17.28	155.22	
1	E3 Structures	@ 21.54	21.54	
7	F1A Additions	@ 6.20	43.40	
12	F5B H. Guys	@ 8.90	106.80	
2	F6B H. Guy and Stub	@ 24.31	48.62	
12.6	Miles F8 Conductor	@ 136.20	1,716.12	
4	Miles F10 Conductor	@ 238.00	952.00	
			$7,320.82	$7.320.82

SERVICES AND RUN OFFS

23	F11 Services	@ 25.43	584.89	
9	F14 Secondary Span	@ 21.14	190.26	
11	F12 Primary Span	@ 28.78	316.58	
14	F13 Extra Spans	@ 20.52	287.28	
20	F5A Guys	@ 7.40	148.00	
2	F6A Stub and Guys	@ 21.68	43.36	
			1,570.37	$1,570.37

23	F16 Transformer installations	@ 129.39	2,975.97
23/100	F20 Substation	@ 876.92	201.69
23/100	F25 Extras	@1116.80	256.86
			12,325.71
	Engineering and Superintendence 10%		1,232.57
	Total Capital Cost		$13,558.28

VEGREVILLE AREA

#2

AREA 1 Township

66 Farms -- 21 Good 5 Fair 40 Fair

Probable Connection 23 34 %

Number Farms within ½ mile of lines 35 or 53 %

Proposed line on Road Allowance 16.6 Miles

Run offs to farms 1.4 miles

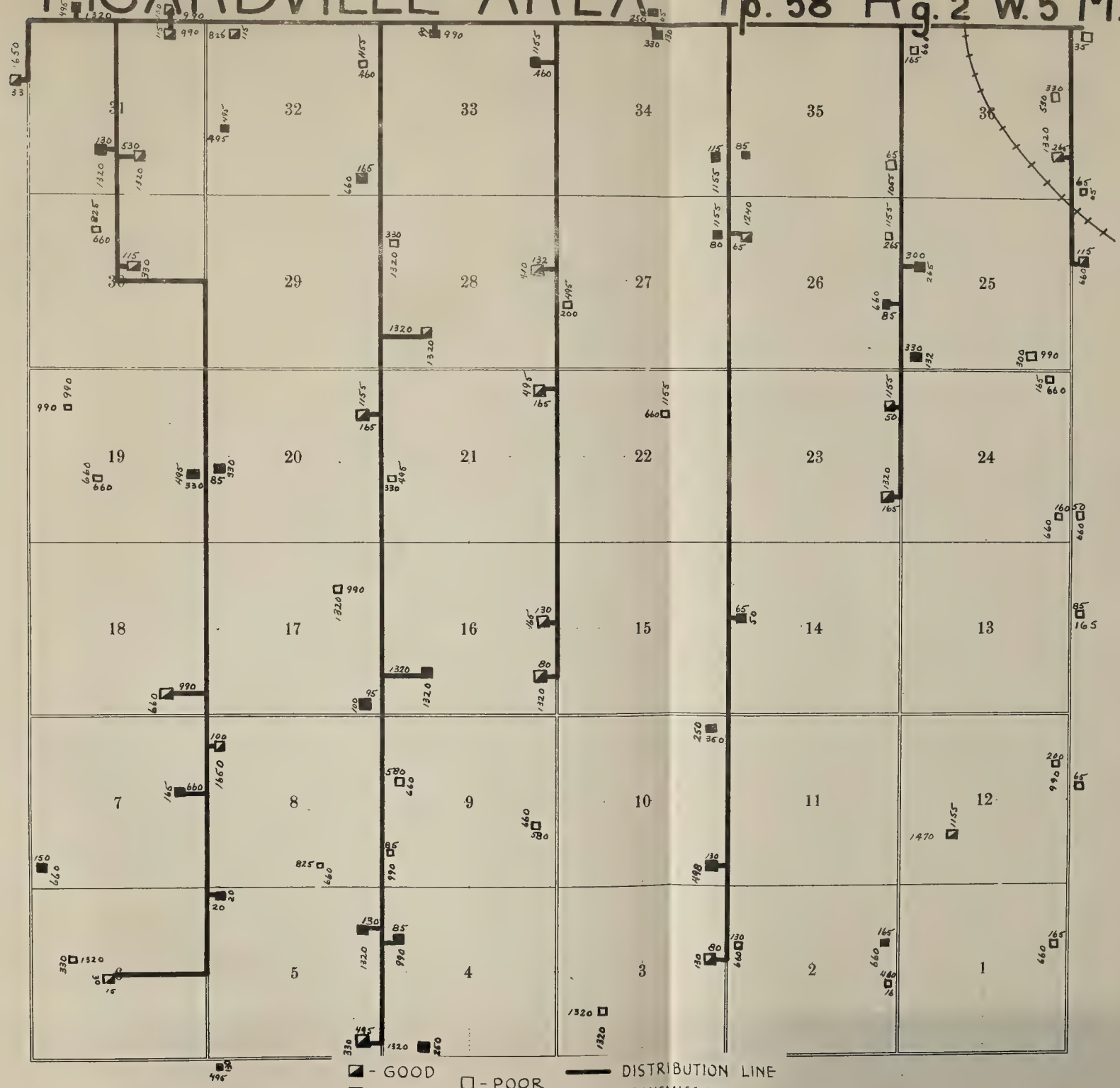
18.0 Miles

Railroad Crossings 0

Cost per connection $589.49

Miles of line and run off per connection .78

PICARDVILLE AREA Tp. 58 Rg. 2 W. 5 M.



PICARDVILLE AREA

FARM LINE

544	F1 Structures	@ 15.22	$8,279.68	
8	F2 Structures	@ 17.28	138.24	
4	F3 Structures	@ 21.54	86.16	
6	F1A Additions	@ 6.20	37.20	
21	F5B Guys	@ 8.90	186.90	
1	F6B Stub and Guy	@ 24.31	24.31	
4	Miles F10 Conductor	@ 238.00	952.00	
28.2	Miles F8 Conductor	@ 136.20	3,840.84	
			13,545.33	$13,545.33

SERVICE AND RUN OFFS

36	F11 Services	@ 25.43	915.48	
19	F12 First Spans	@ 28.78	527.82	
13	F13 Extra Spans	@ 20.52	266.76	
13	F14 Secondary Spans	@ 21.14	274.82	
48	F5A Guys	@ 7.40	355.20	
4	F6A Stub and Guys	@ 21.68	86.72	
			2,426.80	2,426.80
36	F16 Transformer Installations	@ 129.39		4,658.04
36/100	F20 Substation	@ 876.92		315.69
36/100	F25 Extras	@1116.80		402.04
2	F23 Railway Crossings	46.60		93.38
				21,441.28
	Superintendence and Engineering 10%			2,144.12
				$ 23,585.40

PICARDVILLE AREA

#7

AREA 1 Township

83 Farms -- 23 Good 27 Fair 33 Poor

Probable Connections 36 43%

Number offarms within ½ mile of lines 65 78%

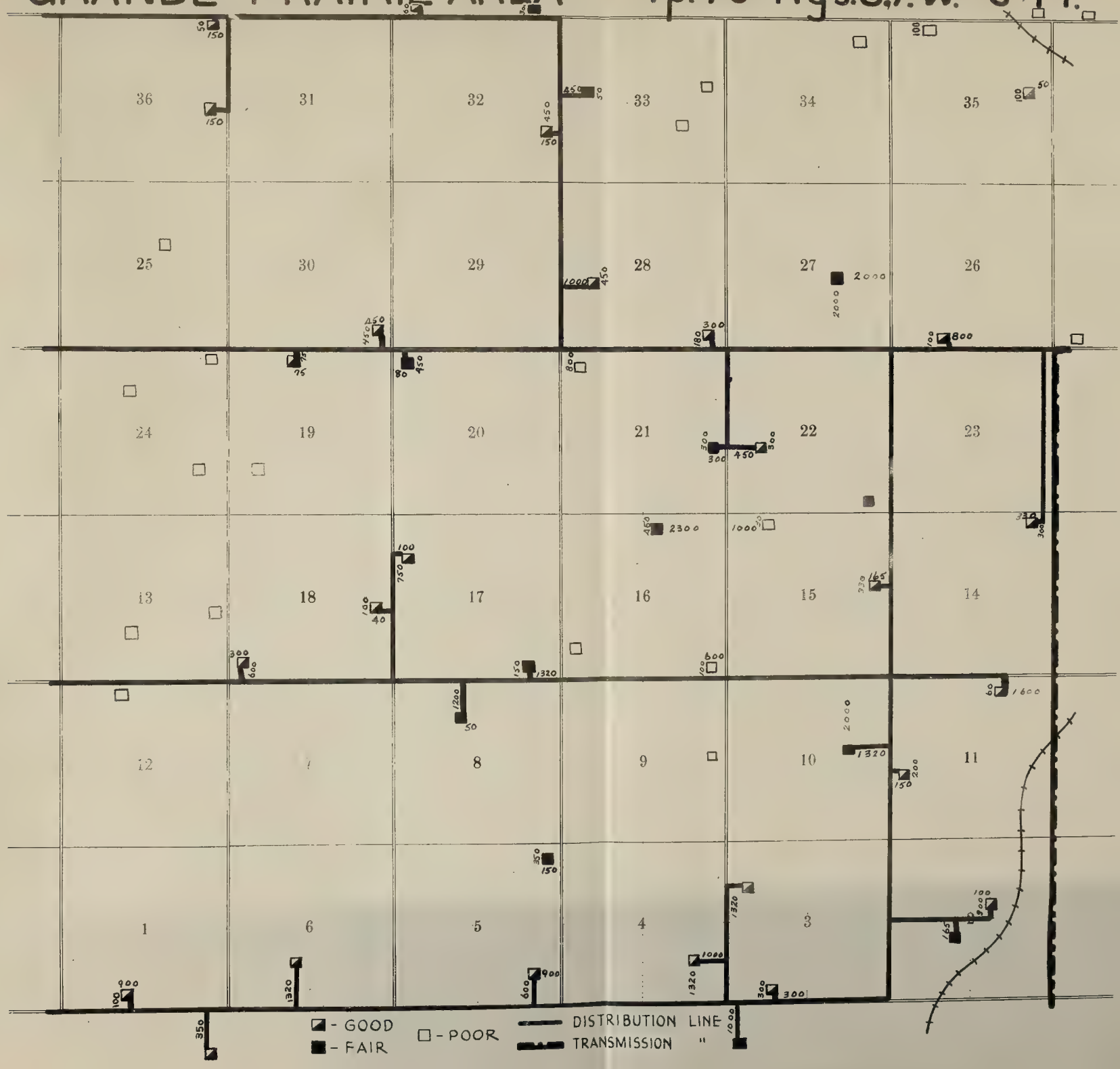
Proposed lines on roads	32.2 miles
Run offs to Farms	2.2 miles
Total	34.4 miles

Railway Crossings 2

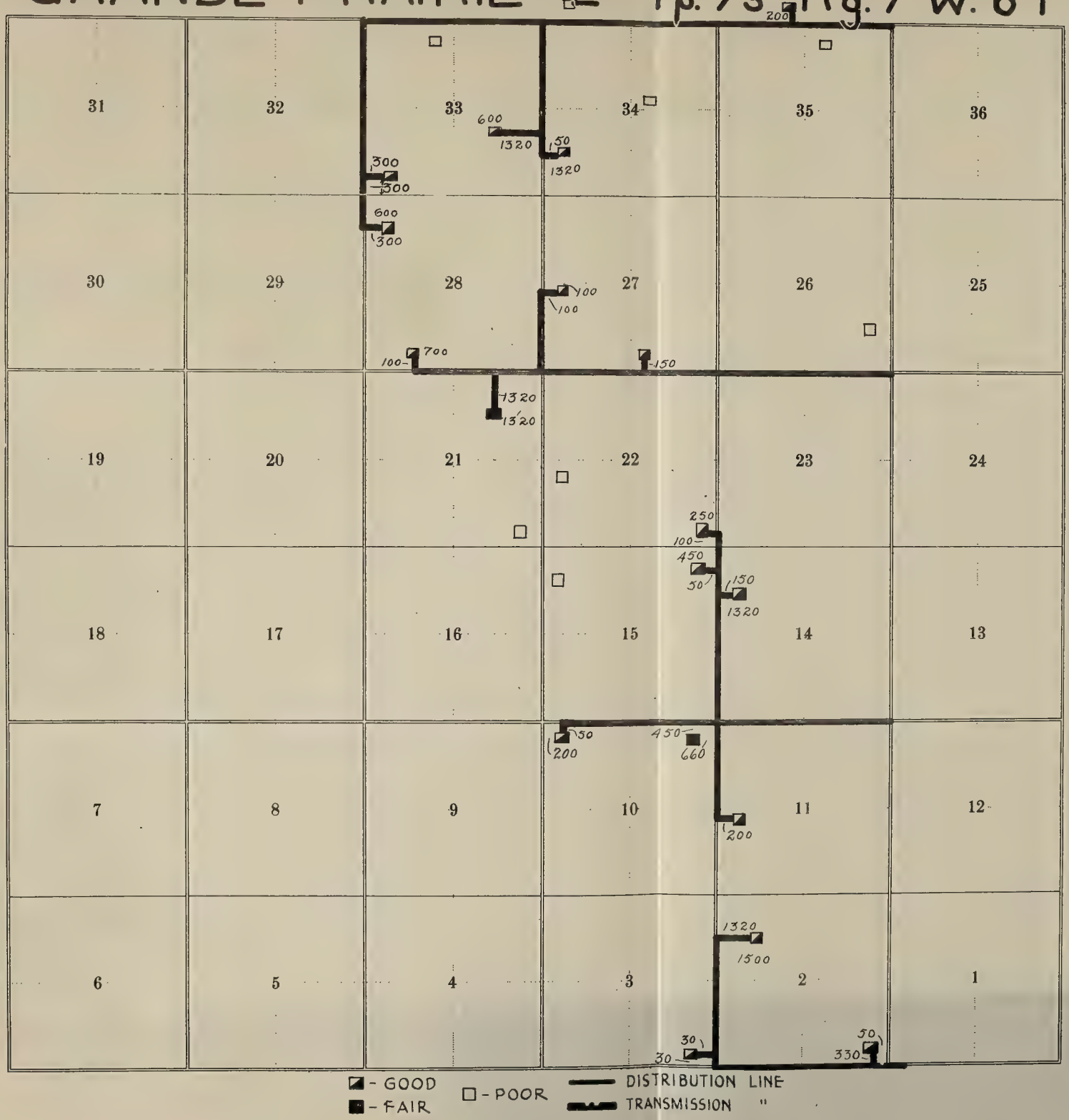
Cost per connection $655.15

Miles of line and run offs per connection .95

GRANDE PRAIRIE AREA Tp. 73 Rgs. 6, 7. W. 6 M.



GRANDE PRAIRIE #2 Tp. 73 Rg. 7 W. 6 M.



GRANDE PRAIRIE AREA

FARM LINE

728	F1 structures	@ 15.22	$11,080.16	
16	F2 Structures	@ 17.28	276.48	
4	F3 Structures	@ 21.54	86.16	
14	F1A Additions	@ 6.20	86.80	
24	F5B Guys	@ 8.90	213.60	
7	F6B Stub and Guys	@ 24.31	170.17	
36	Mi. F10 Conductor	@ 238.00	1428.00	
37	Mi. F8 Conductor	@ 136.20	5039.40	
			$18,380.77	$18,380.77

SERVICE AND RUN OFFS

50	F11 Services	@ 25.43	1,271.50	
29	F12 First Spans	@ 28.78	834.62	
35	F13 Extra Spans	@ 20.52	718.20	
25	F14 Secondary Spans	@ 21.14	528.50	
22	F5A Guys	@ 7.40	162.80	
7	F6A Guys	@ 21.68	151.76	
			$3,667.38	3,667.38

50	F16 Transformers	@ 129.39	6,469.50
50/100	F20 Substation	@ 876.92	438.46
50/100	F25 Extras	@1116.80	558.40
			$ 29.514,51
	Engineering and Superintendence 10%		2,951.45
	Total Capital Cost		$ 32,465.96

GRANDE PRAIRIE AREA

#3

AREA 1½ Townships

84 Farms -- 42 Good 16 Fair 26 Poor

Probable Connections 50 59%

Number of Farms within ½ mile of lines 70 or 83%

Porposed line or road allowance	43.0	mi.
Run off per farm	4.4.	mi.
Total	47.4	mi.

Cost per connection $649.31

Miles of line and run offs per connection .94

3. Grand Estimated Cost Summary for 10 Areas Surveyed.

GRAND ESTIMATED COST SUMMARY OF 10 AREAS SURVEYED

	Approx. Area Sq. Miles	No. of Farms in Area	Probable Connections		Total Miles of Line	Connections per Mile	Miles of Line per Connection	Estimated Total Cost	Estimated Cost per Connection
			No.	Per Cent					
				%				$	$
THREE HILLS	36	42	32	76	22.8	1.40	0.71	17,902.50	559.45
STETTLER	36	49	21	42	20.7	1.01	0.98	14,119.36	672.35
CASTOR	36	44	21	47	23.4	0.90	1.10	15,948.83	759.46
ELLERSLIE	36	130	103	79	54.6	1.89	0.53	47.795.86	464.03
VERMILION	18	27	13	48	11.1	1.17	0.85	8,227.02	632.84
CLANDONALD	36	62	41	66	35.9	1.14	0.87	25,568.41	623.62
ST. PAUL	36	70	40	57	31.3	1.27	0.78	23,605.71	590.14
VEGREVILLE (MUNDARE)	36	66	23	34	18.0	1.27	0.78	13,558.26	589.48
PICARDVILLE	36	83	36	43	34.4	1.05	0.95	23,585.40	655.15
GRANDE PRAIRIE	54	84	50	59	47.4	1.05	0.94	32,465.84	649.31
ALL AREAS	360	657	380	57	299.6	1.27	0.78	222,777.19	586.28

IV Dominion Electric Power Limited.

Suggested

POST WAR RURAL SYSTEM

From Peace River to Berwin Alberta

LEGEND

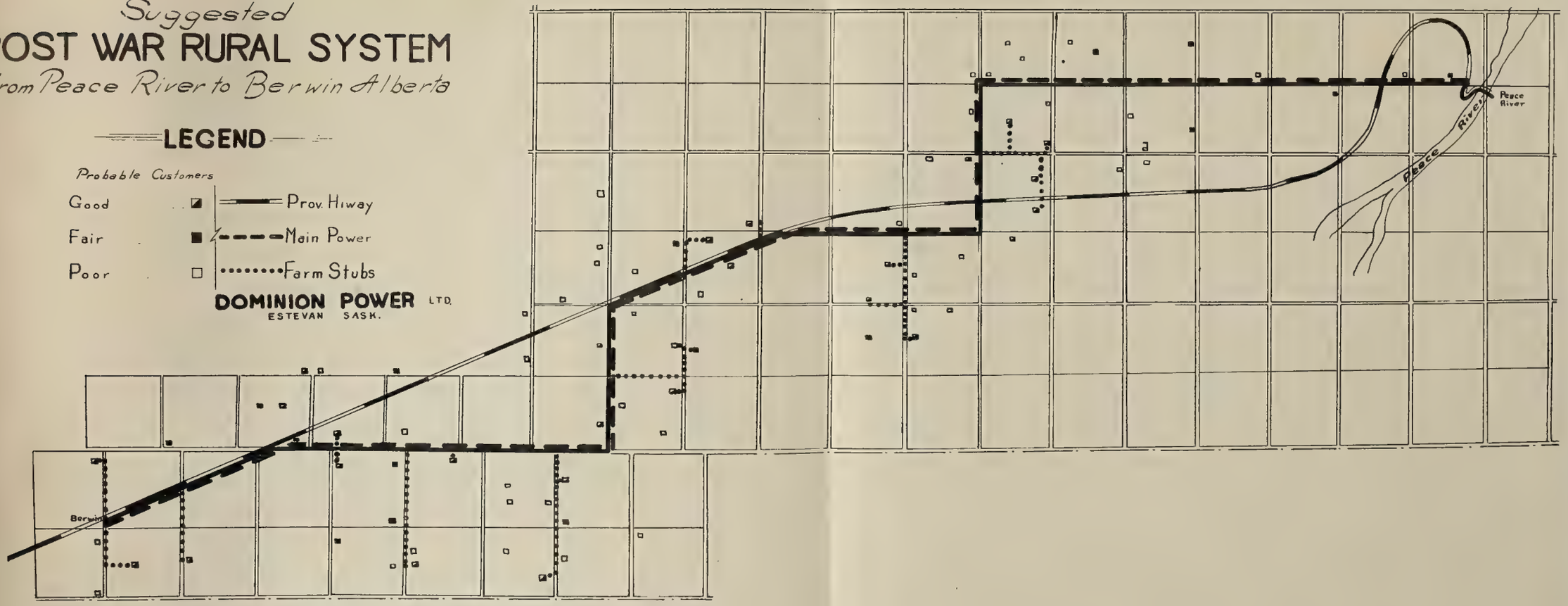
Probable Customers

Good ◪ ═══ Prov. Hiway

Fair ■ ---- Main Power

Poor □ ..... Farm Stubs

DOMINION POWER LTD.
ESTEVAN SASK.



DOMINION ELECTRIC POWER LIMITED.
Estevan, Saskatchewan

Jan. 19th, 1944.

Prof. Andrew Stewart,
Dept. of Economics,
University of Alberta,
EDMONTON, Alberta

Dear Mr. Stewart:

I found it impossible to stay over in Edmonton on my return trip from Dawson Creek, and since then have been laid up, and doubt if I will find it possible to go north again until March.

We have secured information from which we can develop the type of farm line which we feel is desirable in areas such as we serve where there are no regular transmission lines in existence, and power is supplied from the smaller high cost diesel plants, and to our mind this is the best of the propositions in the three areas which Dominion serves.

We have developed a line starting from Peace River on a design that will serve as a sub transmission or as a low distribution line serving the villages of Grimshaw, Berwyn, and the Peace River airport all at our plant at Peace River, and ultimately will probably go on west to the town of Fairview We would plan that the line would operate at 13200 volt, neutral grounded, so that a 7620 volt transformer can be used for farm service.

At present the two small villages are served by separate plants and are giving reliable twenty-four hour A. C. service, but the capacity of the plants are small, and it is impossible to handle the starting currents of small motors, as there is not sufficient generator and prime mover flywheel capacity to get them rolling.

A line such as we have suggested would partially eliminate the high cost plants at these towns, probably making possible higher saturation of domestic appliances, and because of the extension of the rural distribution lines would make the farm service possible at low cost and without separate transformation.

The extension to serve these towns has been on our agenda since about 1936, but the cost of the river crossing at Peace River was always the stumbling block. Since this crossing has now been completed for military purposes, that problem is solved.

The line itself will stand on its own feet financially, that is, it is economically justified, and will over a period of time pay interest on its investment.

We have not inspected the area further than two miles from the route of the line, because of winter conditions, and also because it was desired to get a rough picture of what could be done. The information has been obtained entirely from inspection and without contacting the farmers.

Certain interesting features are noticeable on this development:-

Rural telephones are not numerous in the area, and an opportunity exists to provide joint construction to serve these people with both services, or possibly to make an experimental study of the carrier system which is in development by the R. E. A. We still feel that the rural telephone is of greater importance to the farmer than is lighting.

Native tamarac poles are available within ten miles of the line, and this makes possible a true test of the co-operative idea, as the farmers can be employed during the winter months to procure poles for the section of line proposed for the transmission line, and could be employed to haul these poles to the holes, and may, with this experience go out and get their own poles for their stub lines, and probably erect the complete line with the exception of the conductor handling and final completion of the line.

The actual power requirements of the farmers in such an area where wheat farming is the generel idea will probably be disappointing, but the small domestic appliance equipment can be made available.

Service as shown would be available to roughly twenty-eight customers on the fifteen miles of farm stub, so that it would be about the commonly accepted minimum for which

service can be justified, although there are eighty-eight farms in the area served, none more than two miles from the line, and should their economic conditions improve, it would be possible to supply them.

The airport is near the route and can be served if it develops further, but it may influence the route of the line, and its plans will have to be investigated further.

I hope that this outline will be of interest to you, and will possibly be the starting point for some development when conditions get to that point.

Yours very truly,

(Sgd) N.W. Du Bois
SUPERINTENDENT OF DISTRIBUTION

nwd:s

DOMINION ELECTRIC POWER LTD.

Estevan, Sask.

Nov. 17th, 1943.

Prof. Andrew Stewart,
Dept. of Economics,
University of Alberta
EDMONTON, Alberta.

Dear Mr. Stewart:

Along the lines of our discussion in Calgary last week I have attached hereto a copy of the commercial and residential rate schedules which we have in effect at each of our Alberta points.

You will also find a copy of the rural schedule that we have set up for Saskatchewan territory which has been revised to show the schedule we would make available for any individual rural customer adjacent to the communities served in Alberta, all of which is high fuel cost territory, (13.9¢ at Peace River).

The only schedule that we feel requires any comment is possibly the McLennan area. At this point which is an unincorporated hamlet, we have not been able to get any arrangements made for street lighting service. For this reason schedules are higher than at other points. It is expected that by the spring this hamlet will be incorporated at which time the rates will be changed to those in effect at Athabasca.

We will later send a copy of a brief which has been prepared covering the rural situation as we see it in Saskatchewan which we feel will be interesting at least.

Similarly in Alberta in the territory which we serve we feel that the first step in a logical development would be as follows:

Athabasca:

A 4600-8000 V. line from Athabasca to Colinton which would serve Colinton and would make service available to the few farmers along the route. Later some areas west of Athabasca along the Peace River highway can be served.

McLennan:

A 4600-8000 V. line west from McLennan to Fahler and Donnelly was proposed in 1939 when we offered to erect a line of this type. The town did not see fit to go ahead, and copper restrictions later eliminated the proposition.

Peace River:

It is logical to expect a 7620/13200 V. line can be justified at any time from Peace River to Fairview, serving the communities enroute, and a great number of very good farms within reach from such a line. When this development actually occurs it would be probably that the existing small plants at Grimshaw and Berwyn would be abandonned, using the Fairview plant as a peak load and standby unit.

We hope that the preliminary information that we have offered will be of value to you.

It is the intention that either Mr. Schlosser, our General Manager, or I willmake a trip north the first week in December, and that we should possibly be enroute back about the time you hold your conference in Edmonton.

Yours very truly,

(Sgd) N. W. DUBOIS
SUPERINTENDENT OF DISTRIBUTION

nwd:s
Enc.

V. Submission of Plans and Specifications to Mr. Vernon Pearson, Mechanical Superintendent, Mechanical Branch, Edmonton.

CALGARY POWER COMPANY LIMITED

CALGARY,
Canada

November 18th, 1943.

Professor A. Stewart,
Department of Economics,
University of Alberta,
Edmonton, Alberta.

Dear Sir:

Following your suggestion when you were in Calgary recently, we have made up some drawings to show a suggested type of construction for the proposed 6900 volt farm lines. Two sets of prints of these drawings are attached for your use.

In order to clarify the drawings, we have also made up some suggested specifications to cover the construction points which differ from the prsent Provincial Electrical Act. Two copies of this information are also attached to this letter.

At the present time the Provincial regulations require 6' separation between a 6900 volt phase wire and the neutral or ground wire, if the neutral wire is attached to a rack or other similar construction. In order to construct these farm lines at the lowest possible cost, we have suggested that this distance be reduced to approximately 3'. In this way we will be able to get satisfactory ground clearance using 30' poles, and a normal span of 325', and this will result in a considerable saving in the cost of the line. We do not feel that there should be any serious objection to this decreased clearance as the line will not be worked on when energized, and we find that the Shawinigan Water & Power Company, The Ontario Hydro Electric Power Commission and the R.E.A. in the United States use similar clearances.

Longer poles will of course be used for grading purposes and at other points where they are required to maintain specified clearances.

The ground clearances which we have shown differ slightly from the present Provincial requirements, but we believe that they are safe and in line with good construction practice.

Prof. A. Stewart

At the present time it is customary to put strain insulators in all guy wires which pass between secondary wires, or which may create a hazard to a lineman operating a switch. In the proposed construction, we are using a solidly grounded neutral with each guy wire directly connected both electrically and mechanically to this grounded neutral. In this way, each anchor rod provides an additional grounding contact for the network neutral without the expense of installing special ground rods. The network will be grounded at the customer's transformer, at the customer's service entrance and at any guys which are used on the line.

You will notice that we have not definitely specified the exact type of hardware to be used on the construction work. This is becasue we did not feel it desirable to specify any particular manufacturer's equipment at this time. A list of the material will be furnished the authorities at a later date. We are obtaining samples of transformer and hardware items for further study of construction details.

We are rechecking the unit costs and if you care to send us your township plans we will make up the estimates jointly

and forward you complete cost data and plans as soon as available.

If there are any points which we have omitted to mention, please do not hesitate to get in touch with us at your convenience.

Yours very truly,

CALGARY POWER COMPANY LIMITED,

Per: H.B. LeBourveau

CANADIAN UTILITIES LIMITED,

Per: E. Kelly,

HBL:GM
Atts.

SUGGESTED SPECIFICATIONS FOR 6,900V GROUNDED NEUTRAL FARM LINES

Poles: 30' A.S.A. Class 6, for tangent structures with selected poles equivalent to Class 5 or better, for all transformer and corner structures.

All poles to be Penetrex butt treated with 50/50 creosote mixture guaranteed 3/8" penetration.

Conductor: The following wire is being considered for farm line conductors:-

Guage	Description	Weight per 1000'	Breaking Strength
8 solid	Steel	73.5	1711
8 stranded	Steel, 3 strands	75	1753
6 solid	Steel	112	2589
6 stranded	Steel, 3 strands	112	2604
3 - #12	Copperweld 40%	54.4	2040
8A	Copperweld	74.3	2233
4	ACSR (4 steel 3 alum)	74.3	4170

(other types and sizes of conductor are receiving consideration)

Stringing Tension: The conductors shall be strung so that the maximum tension shall not exceed 50% of the breaking strength under medium loading conditions of 1/4" ice and 4 lbs. wind at 15°F.

Span: Ruling spans shall be 325' with shorter spans not exceeding 150' at road crossings.

Ground Clearance: The minimum clearance for neutral conductors shall be as follows:

Across main highways and along thoroughfares in urban districts)	18'
In rural districts & across secondary highways or in areas accessible only to agricultural equipment.	16'
In areas accessible to pedestrians only.	14'
Over telephones and other communication circuits.	2'

Clearance between grounded neutral wire and phase wire shown on detail drawings.

Guys: Guying details showing breaking strength of guy wire and holding strength of expanding anchors shown on detail prints.

The anchor rods will be used as additional grounding for

Guys: (cont) the neutral and no strain insulators will be used.

Guy guards to be used only on guys in exposed and/or dangerous location.

Grounds: It is suggested that all arrester, primary neutral, secondary neutral, and equipment grounds shall be solidly interconnected according to common practice in other areas both in Canada and the United States.

In addition to the above, service entrances shall be grounded according to present regulations. Additional grounding will be provided from the neutral wire to each anchor rod.

These specifications are by no means complete but we believe cover the main points of difference with some of existing regulations. They are suggested merely as a basis for further discussion.

GOVERNMENT OF THE PROVINCE OF ALBERTA

MEMORANDUM

From Mr. S.A.B. Kembry,
Chief Electrical Inspector,
Old Court House Building,
Calgary.

Date December 2nd, 1943.

To Mr. Vernon Pearson,
Mechanical Superintendent,
Mechanical Branch,
Terrace Building,
Edmonton.

I wish to acknowledge the receipt of your memorandum of November 22nd with attached plans and specifications of the proposed rural electrification scheme. Some two weeks ago I received a call from Mr. LeBourveau with regard to this scheme, and later spent an afternoon going into the details with Mr. LeBourveau and Mr. Kelly.

In general it appears that the proposed construction is similar to that used by the United States Government during recent years for rural electrification projects, and while there are some points where the proposals conflict with our present regulations, there does not appear to be any radical or hazardous practices involved.

As you will note, these plans and specifications are of a tentative nature, and in view of this, I do not think a detailed discussion of them would be useful at the present time.

I would recommend that the power companies interested be advised that, if construction is based on the plans and specifications used by the Rural Electrification Administration projects in the United States, it will receive approval in this province. There are some details, such as the number, type and resistance of grounds to be used on the common neutral conductor, and the methods used to protect these ground wires, which may require some changes, but this would not affect the total cost of the construction to any great extent.

To cover this type of construction I would recommend that a new section be added to our regulations for general construction. The rural scheme would be treated as an entirely separate type of installation.

I am returning herewith copy of the plans and specifications forwarded to me, as Mr. LeBourveau had already provided me with a copy of these.

Yours very truly,

Signed S. A. B. Kembry
Chief Electrical Inspector

SK:RM
enc.

COPY

VI. Post-War Spare Generating Capacity

Estimate of Anticipated Ultimate Load
Drop with cessation of Hostilities.

		K.V.A.
Alberta Nitrogen		
Assuming one-half plant capacity as Peace time normal --		8,000
Airports:		
Bowden E.F.T.S.	197	
Claresholm E.F.T.S.	564	
DeWinton E.F.T.S.	220	
High River E.F.T.S.	140	
Vulcan S.F.T.S.	472	
Lethbridge B. & G.	250	
Macleod S.F.T.S.	492	
Pearce F.I.S.	400	
Penhold S.F.T.S.	600	
		3,835
Army Camps:		
Camrose	135	
Wetaskiwin	96	
Wainwright	198	
Red Deer	150	
		579
P.O.W. Camps:		
Kananaskis	72	
Lethbridge	672	744
City of Calgary:		
Industrial, Airports, Army and associated loads		6,000
General System drop		
Domestic, Commercial etc.		1,000
		20,148

January 21, 1944

Prof. A. Stewart,
Department of Political Economy,
University of Alberta,
EDMONTON, Alberta.

Dear Mr. Stewart:

Re: Spare Generator Capacity

In reply to your letter of the 16th instant, the generator capacity that would be available for farm electrification purposes in our various districts in Alberta is as follows:

Grande Prairie District - 400 K.W.

On the basis of a diversified peak demand of 500 watts per customer, this should care for some 800 farms, which we believe will carry that district for some years to come.

Drumheller District

The spare capacity available in the Drumheller District is in the neighbourhood of 2500 K.W. We are considering the instalation of a new 5000 K.W. machine in Drumheller after the war, to replace one of our older machines on which the efficiency is very low. The instalation of this new machine will increase the spare capacity available.

Vegreville District

In this District, we purchase our power in bulk from the Calgary Power Company. In addition, we have 426 K.W. in plant capacity in this District, but this plant is used only in emergencies and for regulation purposes and should not be taken into consideration for the purpose you have in mind. I understand the Calgary Power have written you direct and that they will have something in the nature of 20000 K.W. available.

In addition, the Cities of Edmonton and Lethbridge should also have considerable spare capacity after the war. Mr. McFarlane would be in a position to give you this information as far as the City of Edmonton is concerned, and a letter from you to Mr. Jack Watson, Commissioner of the City of Lethbridge will, no doubt, advise you as to their capacity.

There is no doubt as far as our Company is concerned, that we will be making a determined endeavour to get new loads after the war, but as the picture looks today, there will be plenty of generating capacity

for any load in sight at present.

Yours very truly,

Canadian Utilities Limited.

EK:OF

E. Kelly.

cc: Mr. MacGregor.